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UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Northwest Region
7600 Sand Point Way N.E., Bldg. 1
Seattle, WA 98115

Refer to NMFS No: WCR-2015-3013

June 14, 2016

Cheryl Probert
Forest Supervisor
Nez Perce-Clearwater National Forests
903 Third Street
Kamiah, Idaho 83536

Richard White
Field Office Supervisor
Cottonwood Field Office
1 Butte Drive
Cottonwood, Idaho 83522

Re: Endangered Species Act Section 7(a)(2) Biological Opinion, and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the South Fork Clearwater River Suction Dredging Program, Idaho County, Idaho, HUC 17060305 (One Project)

Dear Ms. Probert and Mr. White:

Thank you for your email of April 7, 2016, requesting initiation of consultation with NOAA's National Marine Fisheries Service (NMFS) pursuant to section 7 of the Endangered Species Act of 1973 (ESA) (16 U.S.C. 1531 et seq.) for the South Fork Clearwater River Suction Dredging Program. The enclosed document contains a biological opinion (Opinion) prepared by NMFS on the effects of the Nez Perce-Clearwater National Forests' (FS) and Bureau of Land Management Cottonwood District's (BLM) South Fork Clearwater River Suction Dredging Program. In this Opinion, NMFS concludes that the action, as described, is not likely to jeopardize the continued existence of Snake River Basin steelhead and Snake River fall Chinook salmon, nor result in the destruction or adverse modification of designated critical habitat for these species.

As required by section 7 of the ESA, NMFS provided an incidental take statement (ITS) with the Opinion. The ITS describes reasonable and prudent measures NMFS considers necessary or appropriate to minimize incidental take associated with this action. The take statement sets forth nondiscretionary terms and conditions, including reporting requirements, that the Federal agency and any person who performs the action must comply with to carry out the reasonable and prudent measures. Incidental take from actions that meet these terms and conditions will be exempt from the ESA take prohibition.

This document also includes the results of our analysis of the action's likely effects on essential fish habitat (EFH) pursuant to section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA), and includes four conservation recommendations to avoid, minimize, or otherwise offset potential adverse effects on EFH. These conservation recommendations are not identical to the ESA terms and conditions. Section 305(b)(4)(B) of the MSA requires Federal agencies to provide a detailed written response to NMFS within 30 days after receiving these recommendations.

If the response is inconsistent with the EFH conservation recommendations, the FS/BLM must explain why the recommendations will not be followed, including the justification for any disagreements over the effects of the action and the recommendations. In response to increased oversight of overall EFH program effectiveness by the Office of Management and Budget, NMFS established a quarterly reporting requirement to determine how many conservation recommendations are provided as part of each EFH consultation and how many are adopted by the action agency. Therefore, in your statutory reply to the EFH portion of this consultation, we ask that you clearly identify the number of conservation recommendations accepted.

Please contact David Arthaud, Snake Basin Area Office, (208) 378-5696, david.arthaud@noaa.gov if you have any questions concerning this section 7 consultation, or if you require additional information.

Sincerely,

Michael P. Tehan

for William W. Stelle, Jr.
Regional Administrator

Enclosure

cc: L. Williams – FWS
R. Hennekey – IDFG
D. Kenney – NPCNF
C. Johnson – BLM
A. Golart – IDWR
T. DeGering – EPA
A. Rogerson – NPT
J. Cardwell – IDEQ

bcc: SBAO – File copy, Read File
NSBO – D. Arthaud, B. Ries, K. Troyer

Arthaud:Troyer:SouthForkClearwaterRiverSuctionDredgingProg:am:20160614:WCR-2015-3013

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Endangered Species Act Biological Opinion
and
Magnuson-Stevens Fishery Conservation and Management Act
Essential Fish Habitat Consultation

South Fork Clearwater River Suction Dredging Program
HUC #17060305, Idaho County, Idaho

NMFS Consultation Numbers: WCR-2015-3013

Action Agencies: Department of Agriculture, Nez Perce-Clearwater National Forests and Department of Interior, Bureau of Land Management, Cottonwood District

Affected Species and Determinations:

ESA-Listed Species	Status	Is Action Likely to Adversely Affect Species or Critical Habitat?	Is Action Likely To Jeopardize the Species?	Is Action Likely To Destroy or Adversely Modify Critical Habitat?
Snake River Basin steelhead (*Oncorhynchus mykiss*)	Threatened	Yes	No	No
Snake River fall Chinook (*O. tshawytscha*)	Threatened	Yes	No	No

Fishery Management Plan Describing EFH in the Project Area	Does Action Have an Adverse Effect on EFH?	Are EFH Conservation Recommendations Provided?
Pacific Coast Salmon	Yes	Yes

Consultation Conducted By: National Marine Fisheries Service, West Coast Region

Issued By: Michael P. Jehan for
William W. Stelle, Jr.
Regional Administrator

Date: June 14, 2016

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ACRONYMS

A/P	Abundance/Productivity
BA	biological assessment
cfs	cubic feet per second
CTU	Centigrade Temperature Units
DPS	Distinct Population Segment
DQA	Data Quality Act
EFH	Essential Fish Habitat
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
ESU	Evolutionary Significant Unit
FCRPS	Federal Columbia River Power System
ft^2	square feet
FWS	U.S. Fish and Wildlife Service
ICTRT	Interior Columbia Basin Technical Recovery Team
IDEQ	Idaho Department of Environmental Quality
IDFG	Idaho Department of Fish and Game
IDWR	Idaho Department of Water Resources
ITS	Incidental Take Statement
JTU	Jackson Turbidity Units
LWD	large woody debris
mg/kg	milligrams per kilogram
MPG	Major Population Group
MSA	Magnuson-Stevens Fishery Conservation and Management Act
ng/L	nanograms per liter
NMFS	National Marine Fisheries Service
NOI	Notice of Intent
NPCNF	Nez Perce-Clearwater National Forests
NPT	Nez Perce Tribe
NTU	Nephelometric Turbidity Units
Opinion	Biological Opinion
PBF	Physical and Biological Features
PFMC	Pacific Fishery Management Council
POO	Plan of Operation
SFCR	South Fork Clearwater River
SR	Snake River
SRB	Snake River Basin
TMDL	Total Maximum Daily Load
FS/BLM	U.S. Forest Service/Bureau of Land Management
USGS	U.S. Geological Survey

VSP	Viable Salmonid Populations
ww	wet weight
yd3	cubic yard

1. INTRODUCTION

This Introduction section provides information relevant to the other sections of this document and is incorporated by reference into Sections 2 and 3 below.

1.1 Background

The National Marine Fisheries Service (NMFS) prepared the biological opinion (Opinion) and incidental take statement (ITS) portions of this document in accordance with section 7(b) of the Endangered Species Act (ESA) of 1973 (16 USC 1531 et seq.), and implementing regulations at 50 CFR 402.

We also completed an essential fish habitat (EFH) consultation on the proposed action, in accordance with section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) (16 U.S.C. 1801 et seq.) and implementing regulations at 50 CFR 600.

We completed pre-dissemination review of this document using standards for utility, integrity, and objectivity in compliance with applicable guidelines issued under the Data Quality Act (section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001, Public Law 106-554). The document will be available through NMFS' Public Consultation Tracking System (https://pcts.nmfs.noaa.gov/pcts-web/homepage.pcts). A complete record of this consultation is on file at Snake Basin Area Office.

1.2 Consultation History

The U.S. Forest Service or Bureau of Land Management (FS/BLM) have not previously conducted ESA consultation on potential effects of dredging operations in the mainstem South Fork Clearwater River (SFCR), because any previous operations were acknowledged by the FS/BLM through a Mining Act of 1872 procedure known as a Notice of Intent (NOI). Until a decision by the 9th Circuit Court of Appeals in 2012 (Karuk Tribe v USFS), the FS/BLM did not consider the acknowledgement of an NOI to be a discretionary action and so did not conduct ESA section 7 consultation on the effects of NOIs. The FS/BLM has not acknowledged any NOIs in the SFCR since the 2012 Appeals Court decision, nor have they approved any Plans of Operation (POOs; a more-intensive regulatory step).

During 2012, U.S. Environmental Protection Agency (EPA) completed consultation with NMFS on a statewide National Pollutant Discharge Elimination System General Permit for small-scale suction dredging in Idaho (NMFS 2012a; NWR/2012/03636). Small-scale suction dredging as a general activity was found to adversely affect ESA-listed salmon and steelhead and their habitat. Most of the Snake, Salmon, and Clearwater drainages containing listed salmon and steelhead and their designated critical habitat were excluded from suction dredging activities of the general permit. However, suction dredging could be permitted if land management agencies managed activities and completed consultation with the U.S. Fish and Wildlife Service (FWS) and NMFS.

Within the Clearwater River drainage, the Nez Perce-Clearwater National Forests (NPCNF) have completed individual ESA consultations on active small-suction dredge programs with the FWS in Lolo and Moose Creeks (2012) and Orogrande and French Creeks (2013), and with NMFS in Lolo Creek (2006b, 2013; NWR/2013/10295). In 2016 and future years, the FS/BLM will require Plans of Operation from prospective suction dredgers on the SFCR. The FS/BLM plans to issue a Decision Notice on the proposed action prior to the 2016 Idaho Department of Water Resources (IDWR) dredging season for the SFCR.

On April 7, 2016, NMFS received a biological assessment (BA) and request for formal consultation from the FS/BLM on a proposed program to permit up to 15 small-suction dredge operations each year in the SFCR mainstem over the next 10 years. In their BA, the FS/BLM concluded that the proposed action may affect, and is likely to adversely affect Snake River (SR) fall Chinook salmon and Snake River Basin (SRB) steelhead, and SRB steelhead critical habitat. NMFS drafted this Opinion to address potential effects from the action. Draft proposed action and terms and conditions sections were emailed to the FS/BLM and to the Nez Perce Tribe (NPT) on May 13, 2016. NMFS received comments from both the FS/BLM and NPT on May 27, 2016. A complete record of this consultation is on file at the Snake Basin Area Office in Boise, Idaho.

1.3 Proposed Action

"Action" means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies (50 CFR 402.02).

The proposed action is the approval of up to a total of 15 POOs to annually operate suction dredges with specific conditions within a portion of the mainstem of SFCR. A POO is an administrative document that a miner (or group of miners) submits each year to the FS/BLM providing specifics on proposed mining operations. The FS/BLM may then modify or add to the terms of the POO to reduce impacts on public resources.

Further details of the proposed action are described in the BA and summarized here. Over the 10-year program term, each year's season will open July 15 and close August 15. Specific locations of operations are not known until submitted by miners prior to each season. Before mining, each POO is conditioned by the FS/BLM and the area is delineated with the miner. The conditioning process uses protective measures to minimize impacts of individual POOs. The proposed action manages impacts among all operations and years by including limits on the size, number, and area of disturbance. The FS/BLM manage the separation between the different operations. Also included are areas to avoid, best management practices to follow during and after mining, monitoring to verify and better understand impacts, and general program compliance. The amount of daily and seasonal effort and rate of dredging will also vary among operations, as will river conditions, over the 10-year program term. The BA provides empirical information from other programs and the literature to help predict impacts. The FS/BLM will monitor the program to ascertain the accuracy of its initial assumptions.

The potential project sites will be located in the mainstem of SFCR within Idaho County, Idaho, from the Harpster Bridge (river mile 15.5, near Green Creek) upstream approximately 47 miles to the origin of the SFCR at the confluence of the American and Red Rivers. Within the ~ 47 mile project reach, the NPCNF manages land through which about 36 miles of the SFCR flows, while the BLM manages about 4.4 miles, of which about 2.7 miles is within the township which includes Elk City (T29N, R8E). Within the full project reach are private parcels through which about 6.4 miles of the SFCR flow. Riparian areas also have the potential to be affected by activities (such as camping and vehicle access) associated with proposed suction dredge operation. Idaho Highway 14 (and about 0.4 miles of Idaho Highway 13) parallel the entire project reach, usually within 100 feet of the active stream channel (Figure 1).

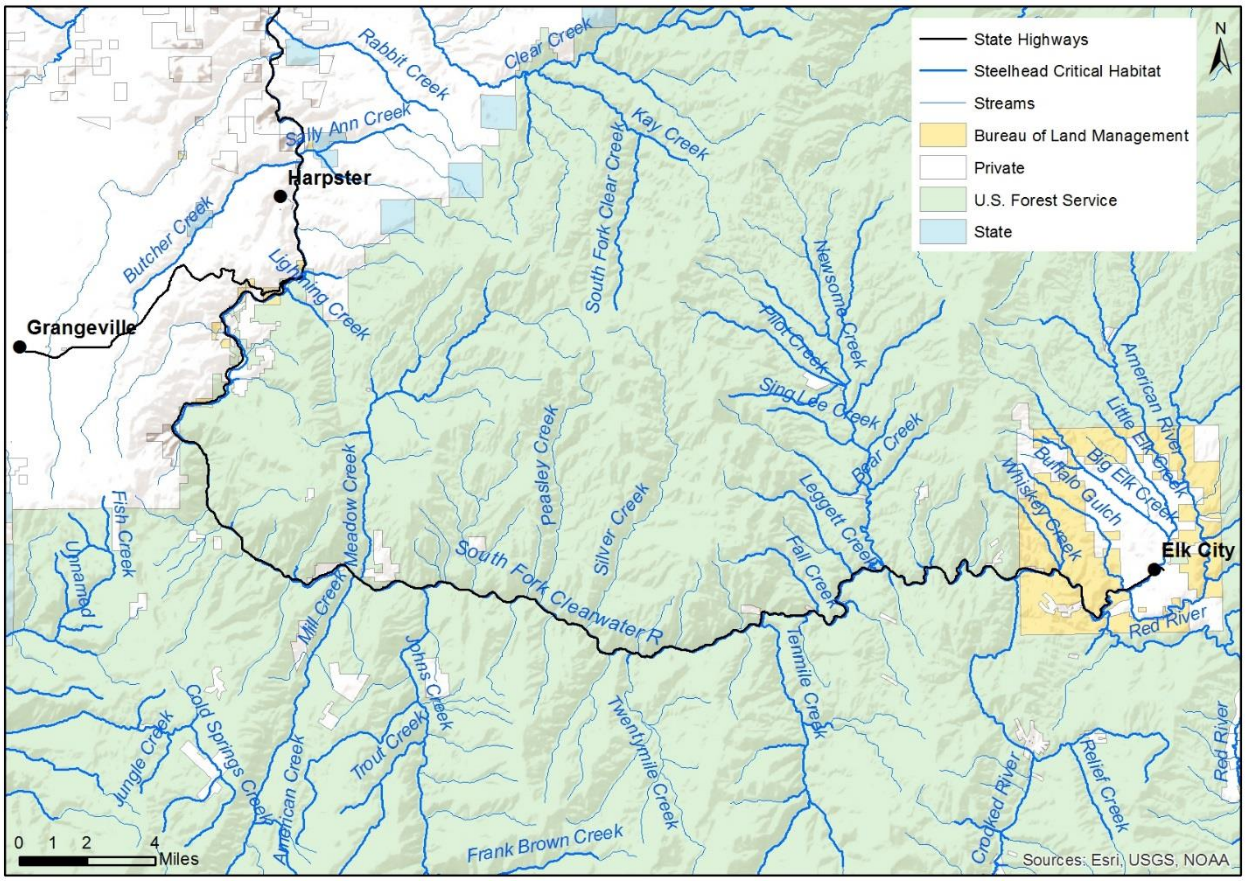

Figure 1. Map of the Upper South Fork Clearwater River.

Areas most likely to be mined within the project area are not yet known. Generally, the upper SFCR may be more conducive to small-scale suction dredging than lower reaches. Recent unpermitted dredge mining has been somewhat concentrated between highway mile markers 39 and 41 (just downstream of the Elk City township), but locations of future proposed dredging sites within the larger project reach cannot be accurately forecast. There are 24 current placer mining claims in the mainstem of the SFCR within the analysis area, and many of these claims are owned by more than one individual. The FS/BLM anticipates that the maximum of 15 operations analyzed under this consultation may be sought each year of the program.

The number of dredging days and hours are also currently unknown. The maximum effort allowed is for 15 operations dredging about 14 hours of daylight per day for 32 consecutive days. However, this level of sustained effort is not expected. Literature and observations indicate active dredging typically occurs at lesser durations, often 2 to 5 hours per day and fewer than 5 days per week (Hassler 1986; Harvey and Lisle 1998). The BA reviewed mining duration from past years in other streams in the Clearwater drainage in an effort to predict what durations of operations would be reasonably certain to occur. During the 2013 dredge season on Moose Creek, the sole operator averaged 4 to 5 hours per day, 3 to 4 days per week in the 5 weeks he dredged. Effort on Moose Creek during 2014 was similar, at a little less than 20% of daylight hours in a week. The FS/BLM expect that most suction dredge operators will actually dredge at this level of intensity for no more than half of the 32 day season. Dredging effort on Lolo Creek in the 2001 season averaged about 14 days among each of the eight operators and during the 1998 season suction dredges were operated 3 to 5 hours per day on average, 4 days per week (NMFS 2006b, 2013).

The actual area and volume of dredged areas is also currently unknown. The FS/BLM proposes to measure potential impact of dredging operations primarily by area of disturbance rather than by volume of dredged material or other metrics. Mean wetted width in the SFCR project area during the summer is about 67 feet, with wider areas generally occurring upstream of Newsome Creek (Dobos 2015). Each POO will be delineated an area that is roughly 150 linear feet by 12 feet, although in some cases where the miner demonstrates that a site is of an insufficient size for the operation, additional reaches may be added up to a maximum site length of 300 linear feet. The entire delineated area within most POOs is not expected to be mined; and impacts will be assessed by the measured area of disturbance.

The FS/BLM limits project disturbance to an annual maximum of 54,000 square feet (ft^2) (300 feet x 12 feet x 15 POOs; 1.2 acres), which is 0.4% of the project river area (Table 1). Additionally, cumulative disturbance among years will be limited to an average annualized rate of 27,000 ft^2 (0.6 acres) or 0.2% of the project area, accrued every third year and at project end. Thus, cumulative maximum disturbance during the program will not exceed 0.6 acres per year and over 10 years will not exceed 6 acres of the 325-acre SFCR project area.

Table 1. Proposed 2016 to 2025 suction-dredging area compared to project reach length and area.

River	Total linear river distance in feet (miles)	Total project river area in feet^2	Maximum total area proposed annually for dredging in feet^2	Maximum proportion of area proposed annually for dredging
SFCR (mainstem within project area)	211,200 (40)	~14,150,400	Up to ~54,000	~0.4%

The FS/BLM propose to delineate specific areas within the proposed dredging operation sites as suitable or not based on stream channel morphology, substrate size, or other biologically relevant conditions. After this habitat delineation by FS/BLM biologists, but prior to the mining season, a field review will be arranged by the FS/BLM for the Streamlined Consultation Level 1 Team members to ensure that the areas proposed by the operators and FS/BLM staff for suction dredging within the operation sites have been delineated in a manner that follows the exclusions noted below and otherwise provides the conservation of fish use and habitat function that the exclusions are designed to provide. The exclusions are designed to conserve fish access to tributaries, spawning areas, potential spawning areas, areas used by young of the year juvenile salmonids, and areas where larger juvenile salmonids hold and feed. The objective of the field reviews is to ensure suction dredging is located so it will have minimum effects to listed species (steelhead, fall Chinook salmon, and bull trout) and their habitat. The field reviews may find that the operation within some portion of an excluded area is possible, and this will require justification by the biologist that the functions for which the exclusions are designed will be maintained at the particular site.

1.3.1 Mitigation and Monitoring

As directed by section 7(a)(1) of the ESA, the FS/BLM propose to implement the following mitigation and conservation measures in 2016 and future years to minimize or avoid adverse effects of the proposed suction dredging activities on steelhead, fall Chinook salmon, and bull trout populations and habitat. These measures also include a means to gather additional information about aquatic habitat conditions for future consultation efforts. In previous years, several monitoring and restorative actions were identified as necessary to minimize effects to fish and aquatic habitats in Moose and Lolo Creeks (NMFS 2013; Kenney 2013, 2014). Modified versions of those measures and others specifically crafted for the SFCR are proposed.

1.3.1.1 Mining Operations

The act of placer mining, with or without dredges, inherently modifies some portion of the stream channel or riparian zone, because substrate, sediment, or soil is moved from one place to another and sorted. As described above, the FS/BLM has authority to place conditions on methods, timing, and locations of this movement and sorting. Site-specific operating conditions, design features, terms and conditions, and mitigation measures which are required, as applicable, for mining operations and associated activities within the proposed program include:

1. The FS/BLM will require each operator to sign a written statement listing and accepting all mitigation and terms and conditions as part of their NOI/POO prior to acknowledging/ approving implementation of their placer mining operation. The operator will also be required to provide description(s) of the specific location(s) of operation within the delineated operating reach, the surface areas and estimated volume of substrate to be dredged/covered or otherwise disturbed, the number of days/hours per day operated, length/breadth of maximum turbidity plume each day, any sightings of ESA-listed species, and descriptions of unusual events. Field forms will be provided to each operator to facilitate recording of this information.

2. Operators will comply with all additional conditions or measures stipulated in all necessary permits.

3. Suction dredging operations will occur only within the wetted perimeter below the ordinary high water line; activities that expand the wetted perimeter (such as streambank alteration) are prohibited.

4. Prior to dredging or conducting other activities that could adversely affect ESA-listed species or their habitat, operators must meet with the relevant FS/BLM unit fisheries biologist and/or other relevant staff who will inspect the proposed operation sites. No dredging, or other movement or modification of substrate, will be allowed in localized areas where ESA-listed salmonids are known to spawn or otherwise concentrate or in likely spawning/early rearing habitat. Miners will also be required to avoid known localized, preferred, and uncommon habitat of salmonid fry, Pacific lamprey larvae, and western pearlshell mussel, including low-velocity backwaters, alcoves, and side-channels (as indicated by clay, silt, or sand substrate). The areas that will be required to be avoided during dredging reach delineation will be specific locations within the proposed operation areas rather than extensive stream reaches.

5. Suction dredges will have a nozzle diameter of 5 inches or less and a horsepower rating of 15 horsepower or less.

6. Pump intakes (but not dredge nozzles) must be screened with 3/32-inch mesh screen.

7. Dredging operations and other instream activities will take place only during daylight hours.

8. Operators will not remove, relocate, break apart, or lessen the stability of substantial in-channel woody debris or instream boulders (>12 inches median diameter). Operators will not remove any large down or standing woody debris or trees for firewood within 150 feet of the SFCR or its tributaries.

   Any cobble or small boulders moved from their initial location in the channel (in order to reach bedrock) would be repositioned into its approximate original configuration in elevation and stream channel morphology and all dredge or other spoil piles must be dispersed by the end of the dredging season. In particular, the operator will not move cobbles or small boulders in the stream course to the extent that substantial alterations of the deepest and fastest portion of the stream channel (or thalweg) persist beyond the end of the dredging season.

9. Operations will not constrict or dam the stream channel or otherwise cause a potential structural barrier to block upstream or downstream fish movement. Dredged or other excavated holes will be backfilled before any new dredge holes are excavated.

   Dredging will be excluded from mainstem SFCR areas within 15 feet laterally and 30 feet downstream of all fish-bearing tributary mouths (Appendix C). Daily operations will not be permitted to hinder fish access to fish-bearing tributary mouths through disturbance, turbidity, or modifications of channel depth or substrate arrangement.

Dredging will be excluded from larger areas of the SFCR near mouths of the six largest tributaries in the upper SFCR: Johns, Tenmile, and Newsome Creeks and Crooked, Red and American Rivers. Dredging will be excluded in the SFCR within 50 feet laterally or to mid-channel, and 50 feet upstream and 150 feet downstream of these major tributary mouths.

If miners desire to dredge between 150 and 300 feet downstream of the tributary mouths specifically named above (and on the tributary entrance side of the river), FS/BLM biologists will survey stream habitat quality in these areas prior to delineation of dredging reaches. Based on the combination of tributary "plumes" of cool water and high quality stream habitat type (in the form of substantial pools, large woody debris (LWD) and boulder cover, etc.), FS/BLM and Level 1 Team biologists will then come to agreement on whether and where additional exclusion areas will be recognized during dredging reach delineation.

In cases where it is more restrictive, the FS/BLM will comply with the IDWR permit that excludes areas within 100 feet upstream and 300 feet downstream of perennial tributaries (Appendix C) and requires that operations shall not hinder fish access to fish-bearing tributary mouths through disturbance, turbidity or modifications of channel depth or substrate arrangement. Variances to the IDWR exclusion must be determined acceptable by the IDWR and fisheries biologist during site inspection.

10. IDWR regulations prohibit dredging in gravel bar areas at tails of pools. Dredging or other disturbance will not be conducted in such a way that fine sediment (sand or silt) covers portions of gravel bars to a depth of more than 0.5-inch, but fine sediment mixed as a minority component with larger substrate is acceptable.

11. Dredging or other mining activities will not occur in the wetted channel within 2 feet of stream banks. Operators will prevent the undercutting and destabilization of stream banks and woody debris or boulders that extend from the bank into the channel and will not otherwise disturb streambanks. If streambanks are inadvertently disturbed in any way, they will be restored to the original contour and re-vegetated with native species at the end of the operating season.

12. Dredges and sluices will not (a) cause current or discharge from the sluice to be directed into the bank causing disturbance to the bank and associated habitat, (b) deposit sediment against the bank, (c) erode or destroy the natural form of the channel, (d) undercut the bank, or (e) widen the channel.

13. Operators will visually monitor the stream for 150 feet downstream of the dredging or sluicing operation. If noticeable turbidity is observed at 150 feet downstream, the operation will cease immediately or decrease in intensity until no increase in turbidity is observed 150 feet downstream.

14. No mechanized equipment will be operated below the mean high water mark except for the suction dredge, sluice, pump, and any life support system necessary to operate a suction dredge. No mechanized equipment will be used for conducting operations, unless specifically acknowledged or approved in a NOI or POO.

15. The FS/BLM and operators will maintain a minimum spacing of at least 800 linear feet of stream channel between active mining operations.

16. To avoid reducing quality of critical migratory and holding habitat for adult listed salmonids, operators will be required to avoid operating dredges within 150 linear feet upstream and 50 feet downstream of the highest quality pool within each ¼-mile of river channel. Salmonids seeking cover and thermal refuge in these pools will not be disturbed and turbidity plumes produced by dredges will not reduce water quality or deposit sediment in the pool.

17. Suction dredges and other motorized equipment will be checked for fuel and lubricant leaks, and all leaks repaired, prior to the start of operations each day. The fuel container used for refueling equipment within the active stream channel will contain less fuel than the amount needed to fill the tank. Unless the dredge or other motorized equipment has a detachable fuel tank, operators will transfer no more than one gallon of fuel at a time during refilling. Operators will use a funnel while pouring, and place an absorbent material such as a towel under the fuel tank to catch any spillage from refueling operations. A spill kit will be available in case of accidental spills. Soil contaminated by spilled petroleum products, will be excavated to the depth of saturation and removed from Federal lands for proper disposal.

18. Except for the 1-gallon or smaller container used for frequent refueling of the dredge or other equipment, gasoline and other petroleum products will be stored in spill-proof containers at least 100 feet from any stream channel and at a location that minimizes the opportunity for accidental spillage to reach the stream channel.

19. Operators will not entrain, mobilize, or disperse any mercury discovered during mining operations. Operators will cease operations and notify the FS/BLM if mercury is encountered in dredged material. Operators will not use mercury, cyanide, or any other hazardous or refined substance to recover or concentrate gold.

20. Mining operations will shut down immediately if any sick, injured, or dead specimen of a threatened or endangered species is found within 100 linear stream feet of a dredge operation, and the operator will notify the appropriate FS/BLM minerals and fisheries staff member within 24 hours of the sighting or discovery.

21. To prevent the threat of aquatic invasive species, suction dredges, tools used while dredging, and associated equipment will be thoroughly cleaned and dried at least 5 days prior to use on FS/BLM-managed lands.

22. Mining operation sites are typically remote from residential areas, so many operators will need to establish camping and equipment/supply sites in relatively close proximity to the

proposed mining site. Camp site, staging areas, and access routes will be proposed by the miner and approved by the appropriate FS/BLM minerals and fisheries staff or Level 1 team in order to minimize disturbance, reduce impacts to riparian vegetation, minimize potential erosion into stream channels, and minimize potential for toxic or sanitary contamination of operational areas. Camping areas, paths, and other disturbed sites that are located within riparian areas and that are created or expanded by mining operations or associated activities will be re-vegetated or otherwise restored to their pre-project condition at the end of the mining season.

23. A bond will be required from each operator prior to initiating mining, which will be used by the FS/BLM to ensure compliance with reclamation of mining sites (including refilling dredge holes, scattering tailings piles, and conforming grades), cleaning campgrounds, or addressing other damages.

1.3.1.2 Permitting and Notice of Intent/Plan of Operation Processing

The FS/BLM will:

1. Require the prospective miner to provide sufficient information (in the form of a complete NOI or POO application) to allow the appropriate FS/BLM unit to determine whether the proposed operation has the potential to affect individuals of an ESA-listed species and, if so, whether the proposed operation is consistent with the BA. In particular, the mining must specify the location, approximate amount of surface area they plan to dredge, and likely dates of operation as well as any operating conditions, design features, and mitigation measures proposed. If the proposed operation is not consistent with this proposed action, the FS/BLM will not issue the permit.

2. To facilitate the processing of NOI/POO submissions, the appropriate FS/BLM minerals and fisheries staff will develop and publicize, with the input of the relevant Level 1 team, its proposed schedule for submission of NOIs or POO applications. The application for a proposed operation will be submitted on a schedule that will allow the FS/BLM staff and Level 1 team sufficient time to review and suggest modifications to the operation to ensure that effects to ESA-listed species are minimized. The information in a NOI/POO application will be used to delineate operational reaches, establish appropriate monitoring protocols, and determine appropriate mitigation measures.

3. Require the prospective miner to demonstrate the actual or likely relevant approval of the IDWR and EPA of their proposed mining operations, and agree to adhere to the relevant requirements of this approval prior to POO approval or NOI acknowledgment. If conditions for a specific activity conflict among IDWR, EPA, and FS/BLM rules, the most stringent condition will be applied to NOI acknowledgment or POO approval.

4. If conditions associated with the relevant IDWR/EPA permits are modified in a manner which could affect ESA-listed species in manner or magnitude not anticipated in this program, the FS/BLM will reinitiate consultation with NMFS and/or FWS. This condition

is proposed by FS/BLM; the broader requirements for reinitiating consultation described in Section 2.10, below, also apply.

1.3.1.3 Mining Monitoring and Reporting

To ensure that SFCR mining operations are conducted in a manner consistent with the operational conditions described in the BA and associated consultation, the FS/BLM will conduct implementation and effectiveness monitoring. In addition, the FS/BLM unit will communicate results of this monitoring to the Level 1 team, FWS/NMFS staff, and other appropriate agencies and entities.

1. Annually, the Level 1 team, after reviewing information gathered by staff and miners for each proposed mining site (called a pre-project checklist; BA, Appendix F), will inform the FS/BLM as to the appropriate type and amount of monitoring necessary to ensure effects on listed species are minimized. This monitoring may be more than the minimum described below and elsewhere in this proposed action.

2. Minimum annual site preparation and monitoring activities by the FS/BLM for each mining operation will include a full delineation of each 50-feet reach, photographs, and sketches of suction dredging or other placer mining sections after receiving Level 1 team approval of the pre-project checklist (BA, Appendix F). The photographs and sketches will clearly document the condition of the active channel of each operational site at its upper and lower boundaries, and at least three cross sections within or in proximity to the site which are likely to be modified.

3. The initial maximum length of a delineated mining operation site will be three reaches or approximately 150 feet. To the extent that the miner demonstrates that a site is of an insufficient size for the operation the appropriate FS/BLM minerals and fisheries staff may add additional reaches up to a maximum site length of 300 feet per season.

4. The FS/BLM staff will coordinate closely with operators to either fully delineate the site and collect data prior to placer mining or to initially direct operators to specific areas within their dredging sections that will have little or no potential for direct effects on fish or persistent effects on their habitat. The appropriate FS/BLM minerals and fisheries staff will also be required to make site visits at all active mining operations during the dredging season to record site information and ensure that miners are complying with NOI/POO conditions. The frequency of these visits will be determined by the Level 1 team, and will depend on the scale of the operation, sensitivity of the operation site, perceived discrepancies between action agency observations and miner reporting, local density of operations, or other logistical, physical, or biological reasons; a minimum of weekly action agency inspections will be the default frequency.

5. The specifics of any additional site monitoring will vary with the location, number, and likelihood of effect of individual mining operations, as well as FS/BLM staff and resources availability. The Level 1 Team will ensure that the FS/BLM is conducting sufficient

monitoring. Additional monitoring procedures will be implemented at Level 1 Team-selected placer mining sites and could include documentation of potential changes in channel morphology, turbidity, or riparian condition as a result of mining, and spawning or fish presence surveys. Common channel morphology monitoring protocols include: (1) Cobble embeddedness estimates and Wolman pebble counts (or other substrate categorization/enumeration methods) at appropriate cross-sections; (2) channel elevation cross-sections; and (3) a longitudinal elevation profile in the stream thalweg. The timing of the pre- or intra-season site delineation and data collection may depend on streamflow levels, operator readiness, and FS/BLM staff availability.

6. A post-project monitoring visit of each mining site will be conducted by the FS/BLM annually. This monitoring will occur within 1-month of the end of the IDWR dredging season. At a minimum, post-project photographs will be sufficient in location and number to allow the FS/BLM unit to document the area of disturbance and any substantial changes in stream channel and riparian conditions when compared with pre-project photos. In particular, project area modifications which are likely to persist into the next fall Chinook salmon or steelhead spawning seasons will be noted.

7. With timing determined by the Level 1 team (but typically early in the dredging season) an interagency field trip will be held annually to review one or more mining operations on each FS/BLM unit (ideally with the permitted miners present). These reviews will inform Level 1 team discussions and determine if any additional mitigation or monitoring measures will be needed to minimize impacts to listed species or their habitat. In addition to the Level 1 team members, representatives from the Idaho Department of Fish and Game (IDFG), IDWR, NPT, and other interested parties may be invited to attend.

8. With timing determined by the Level 1 team (but typically no later than November 30 of each calendar year) the FS/BLM will provide annual draft post-project checklists (BA, Appendix F) to the relevant Level 1 team and to relevant NMFS/FWS offices. A final version of these checklists, with any requested supplemental information, would be provided to the Level 1 team and relevant NMFS/FWS offices by December 31 of each year. These data show when and where dredging occurs, describes operator compliance with suction dredging rules, amount of stream area mined at each site, relevant photos of the mining sites, details about stream bank disturbance and re-vegetation, and any other types of persistent alterations.

9. In particular, as supplemental information provided with the annual checklists, the FS/BLM will calculate the total stream channel area dredged each year and cumulatively. Cumulative disturbance area will not exceed an average rate of 0.2% of the calculated area of the project reach for a period longer than two consecutive years.

10. As an activity separate from any law enforcement, and to check assumptions about cumulative effects, the FS/BLM aquatics/minerals staff will gather information about the potential effects on ESA-listed fish and habitat from any non-approved SFCR suction dredging. This information will include photographs, measurements, and qualitative observations of the mining site.

1.3.1.4 Enforcement of Forest Service/Bureau of Land Management Mining Regulations

1. Concurrent with monitoring of approved-POO miners, FS/BLM staff will attempt to detect and describe non-approved mining in the SFCR. Any such non-approved mining will be reported to FS/BLM law enforcement personnel for disposition.

2. The FS/BLM, with the potential assistance of other state and federal agencies, will take necessary and prudent enforcement actions to block or stop suction dredging in the SFCR which is not consistent with approved POOs or state permits.

1.3.2 Interrelated and Interdependent Actions

"Interrelated actions" are those that are part of a larger action and depend on the larger action for their justification. "Interdependent actions" are those that have no independent utility apart from the action under consideration (50 CFR 402.02). There are no interdependent or interrelated actions associated with this proposed action.

1.4 Action Area

"Action area" means all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02).

For purposes of this consultation, the action area is located in the mainstem of SFCR within Idaho County, Idaho, from 300 yards downstream of the Harpster Bridge (about river mile 15.5, near Green Creek) upstream approximately 47 miles to the origin of the SFCR at the confluence of the American and Red Rivers. Both banks and channel of this mainstem reach are included in the action area. The action area includes other off-site project components such as camping, riparian areas, and refueling areas.

2. ENDANGERED SPECIES ACT: BIOLOGICAL OPINION AND INCIDENTAL TAKE STATEMENT

The ESA establishes a national program for conserving threatened and endangered species of fish, wildlife, plants, and the habitat upon which they depend. As required by section 7(a)(2) of the ESA, Federal agencies must ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species, or adversely modify or destroy their designated critical habitat. Per the requirements of the ESA, Federal action agencies consult with NMFS and section 7(b)(3) requires that, at the conclusion of consultation, NMFS provides an opinion stating how the agency's actions would affect listed species and their critical habitat. If incidental take is expected, section 7(b)(4) requires NMFS to provide an ITS that specifies the impact of any incidental taking and includes non-discretionary reasonable and prudent measures and terms and conditions to minimize such impacts.

2.1 Analytical Approach

This Opinion includes both a jeopardy analysis and an adverse modification analysis.

The jeopardy analysis relies upon the regulatory definition of "to jeopardize the continued existence of a listed species," which is "to engage in an action that would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species" (50 CFR 402.02). Therefore, the jeopardy analysis considers both survival and recovery of the species.

The adverse modification analysis relies upon the regulatory definition of "destruction or adverse modification" of critical habitat that was published in 81 FR 7414 on February 11, 2016. The destruction or adverse modification of critical habitat means, "a direct or indirect alteration that appreciably diminishes the value of critical habitat for the conservation of species. Such alterations may include, but are not limited to, those that alter the physical or biological features essential to the conservation of a species or that preclude or significantly delay development of such features."

We use the following approach to determine whether a proposed action is likely to jeopardize listed species or destroy or adversely modify critical habitat:

- Identify the rangewide status of the species and critical habitat likely to be adversely affected by the proposed action.
- Describe the environmental baseline in the action area.
- Analyze the effects of the proposed action on both species and their habitat using an "exposure-response-risk" approach.
- Describe any cumulative effects in the action area.
- Integrate and synthesize the above factors to assess the risk that the proposed action poses to species and critical habitat.
- Reach jeopardy and adverse modification conclusions.
- If necessary, define a reasonable and prudent alternative to the proposed action.

2.2 Rangewide Status of the Species and Critical Habitat

This Opinion summarizes the status of each species that would be adversely affected by the proposed action. The status is determined by the level of extinction risk that the listed species face, based on parameters considered in documents such as recovery plans, status reviews, and listing decisions. This informs the description of the species' likelihood of both survival and recovery. The species status section also helps to inform the description of the species' current "reproduction, numbers, or distribution" as described in 50 CFR 402.02.

This Opinion also examines the condition of critical habitat throughout the designated area, evaluates the conservation value of the various watersheds that make up the designated area, and discusses the current function of the essential physical and biological features (PBFs) that help to form that conservation value. The designations of critical habitat for Chinook salmon (58 FR 68543) and steelhead (70 FR 52630) use the phrases "essential features" and "primary constituent elements," respectively to identify features essential to the conservation of the species. The new critical habitat regulations (81 FR 7414) replace these with the PBFs phrase, which is the terminology currently used in the definition of critical habitat under the ESA. This shift in terminology does not change the approach used in conducting a "destruction or adverse modification" analysis. Such an analysis is the same regardless of whether the original designation identified the essential features or primary constituent elements. In this Opinion, we use the term PBFs to mean primary constituent elements or essential features, as appropriate for the specific critical habitat.

The species of listed anadromous fish in the action area are SR fall Chinook salmon and SRB steelhead (Table 2). Juvenile life stages of these species use the action area for migration and rearing, and adults use the action area for migration, holding/staging, and spawning. The action area is designated critical habitat for SRB steelhead.

Table 2. Federal Register notices for final rules that list threatened and endangered species, designated critical habitats, or apply protective regulations to listed species considered in this consultation. Listing status: "T" means listed as threatened, "E" means listed as endangered under ESA.

Species	**Listing Status**	**Critical Habitat**	**Protective Regulations**
Chinook salmon (*Oncorhynchus tshawytscha*)			
Snake River fall	T 6/28/05; 70 FR 37160 Originally 4/22/92 57FR14653	12/28/93; 58 FR 68543	6/28/05; 70 FR 37160
Steelhead (*O. mykiss*)			
Snake River Basin	T 1/05/06 71 FR 834; 8/18/97 62 FR 4397	9/02/05; 70 FR 52630	6/28/05; 70 FR 37160

2.2.1 Status of the Species

When examining the status of a species, NMFS uses criteria that describe a 'Viable Salmonid Population' (VSP; McElhany *et al.* 2000). Attributes associated with a VSP are the levels of abundance (number of adult spawners in natural production areas), productivity (adult progeny per parent), and the spatial structure and diversity necessary to: (1) Safeguard the genetic diversity of the listed Evolutionarily Significant Unit (ESU) or Distinct Population Segment (DPS); (2) enhance its capacity to adapt to various environmental conditions; and (3) allow it to become self-sustaining in the natural environment. In 2007, the Interior Columbia Basin

Technical Recovery Team (ICBTRT) further defined population-level viability criteria to address, in combination, all four of the key parameters: (1) Abundance, (2) productivity, (3) spatial structure and (4) diversity (ICBTRT 2007).

Viability attributes are influenced by survival, behavior, and experiences throughout the entire life cycle, characteristics that are influenced in turn by habitat and other environmental conditions. For species with multiple populations, once the biological status of a species' populations has been determined, NMFS assesses the status of the entire species using criteria for groups of populations, as described in recovery plans and guidance documents from technical recovery teams (McElhany *et al.* 2000; NMFS 2015a, 2015b). Considerations for species viability include having multiple populations that are viable, ensuring that populations with unique life histories and phenotypes are viable, and that some viable populations are both widespread to avoid concurrent extinctions from mass catastrophes and spatially close to allow functioning as metapopulations (McElhany *et al.* 2000).

The present risk faced by the ESU/DPS informs NMFS' determination of whether additional risk will appreciably reduce the likelihood that the ESU/DPS will survive or recover in the wild. The greater the present risk, the more likely any additional risk resulting from the proposed action's effects on the abundance (population size), productivity, distribution, or genetic diversity of the ESU/DPS will be an appreciable reduction (McElhany *et al.* 2000).

2.2.1.1 Snake River Fall Chinook Salmon

The SR fall Chinook salmon ESU was listed as threatened on April 22, 1992 (57 FR 14653). This ESU occupies the SRB, which drains portions of southeastern Washington, northeastern Oregon, and north/central Idaho (NMFS 2015a). The SR fall Chinook salmon have substantially declined in abundance from historic levels, primarily due to the loss of primary spawning and rearing areas upstream of the Hells Canyon Dam complex (57 FR 14653). Additional concerns for the species have been the high percentage of hatchery fish returning to natural spawning grounds and the relatively high aggregate harvest impacts by ocean and in-river fisheries (Good *et al.* 2005). On August 15, 2011, NMFS completed a 5-year review for the SR fall Chinook salmon ESU and concluded that the species should remain listed as threatened (76 FR 50448).

Life History. The SR fall Chinook salmon enter the Columbia River in July and August, and migrate through the action area from September through November. Fish spawning takes place from October through early December in the Columbia and Snake Rivers and the lower reaches of several of the associated major tributaries including the Tucannon, Grande Ronde, Clearwater, Salmon, and Imnaha Rivers (NMFS 2015a; Connor and Burge 2003; Ford 2011). Juveniles emerge from the gravels in March and April of the following year.

The SR fall Chinook salmon typically follow an "ocean-type" life history (Dauble and Geist 2000; Good *et al.* 2005) where they migrate while rearing and growing to the Pacific Ocean during their first year of life. Recently, several studies have shown another life history pattern where significant numbers of smaller SR fall Chinook juveniles overwinter in Snake and Columbia River reservoirs prior to outmigration the following spring as yearlings (Connor and

Burge 2003; Connor *et al.* 2002; Connor *et al.* 2005). Water released from Dworshak Dam reduces temperatures of the lower Clearwater and Snake Rivers and spawning extensions into colder, higher elevation areas of the middle Clearwater basin, contribute to reduced growth and delayed migration. Scale samples from natural-origin adult fall Chinook salmon taken at Lower Granite Dam continue to indicate that approximately half of the returns overwintered in freshwater (Ford 2011).

Spatial Structure and Diversity. The SR fall Chinook salmon ESU includes one extant population of fish spawning in the lower mainstem of the SR and the lower reaches of several of the associated major tributaries including the Tucannon, Grande Ronde, Clearwater, Salmon, and Imnaha Rivers. The ESU also includes four artificial propagation programs: the Lyons Ferry Hatchery and the Fall Chinook Acclimation Ponds Program in Washington; the Nez Perce Tribal Hatchery in Idaho; and the Oxbow Hatchery in Oregon and Idaho (70 FR 37160). Historically, this ESU included two large additional populations spawning in the mainstem of the SR upstream of the Hells Canyon Dam complex, an impassable migration barrier. The spawning and rearing habitat associated with the current extant population represents approximately 20% of the total historical habitat available to the ESU (Dauble and Geist 2000). A high proportion of current spawning is concentrated in the SR upstream from Asotin Creek, but recent spawner surveys document spawning across many major tributaries within the population boundaries (e.g., Arnsberg *et al.* 2013, 2014). Spatial structure risk for the existing ESU is therefore low (Ford 2011) and is not precluding recovery of the species.

There are several diversity concerns for SR fall Chinook salmon, leading the ICBTRT to give the lower SR fall Chinook population a moderate diversity risk rating. One concern is the high proportion of hatchery fish spawning naturally. For the 5-year period ending in 2008, 78% of the estimated total spawners were of hatchery origin (Ford 2011). The moderate diversity risk is also driven by changes in major life history patterns; shifts in phenotypic traits; high levels of genetic homogeneity in samples from natural-origin returns; selective pressure imposed by current hydropower operations; and cumulative harvest impacts (Ford 2011). The moderate diversity risk for the population leads to a moderate cumulative spatial structure/diversity risk. Diversity risk will need to be reduced to low in order for this population to be considered highly viable, a requirement for recovery of the species (ICBTRT 2007).

Abundance and Productivity. Historical abundance of SR fall Chinook salmon is estimated to have been 416,000 to 650,000 fish (NMFS 2006a), but numbers declined drastically over the 20th century, with only 78 natural-origin fish passing Lower Granite Dam in 1990 (ODFW and WDFW 2014). The first hatchery-reared SR fall Chinook salmon returned to the SR in 1981, and since then the number of hatchery returns has increased steadily, such that hatchery fish dominate the SR fall Chinook run. Natural-origin returns have also increased. From the most recent status review (Ford 2011) the 10-year mean abundance (1998 to 2008) of natural-origin fall Chinook salmon passing Lower Granite Dam was 2,200 adults; and the recent short-term trend in natural-origin spawners was strongly positive, with the population increasing at an average rate of 16% per year. This 10-year mean abundance is below the ICBTRT's recovery goal of a minimum mean of 3,000 natural-origin spawners for the species' single extant population Table (6) (Ford 2011). Combining the10-year mean natural spawning escapement estimate of 2,200 with productivity estimates of 1.07 to 1.28 results in an abundance/productivity (A/P) rating of moderate risk for this population (Ford 2011). The cumulative moderate risks for both A/P and spatial structure/diversity put this population at moderate risk of extinction over the next 100 years, or "maintained" status (Ford 2011). Natural-origin adult returns over the last 5 years may lessen abundance risk because counts have continued to increase. Natural-origin SR fall Chinook salmon returning to Lower Granite Dam totaled 4,977 in 2009; 7,995 in 2010; 8,778 in 2011; 12,797 in 2012, and 21,124 in 2013 (ODFW and WDFW 2014).

Table 3. Viability assessment for the Lower Snake River Fall Chinook population using IBCTRT criteria.

Snake River Fall Chinook: Brood Years	Abundance and Productivity Metrics				Spatial Structure and Diversity Metrics			Overall Viability Rating
	ICBTRT Minimum Threshold	***Natural Spawning Abundance***	***ICBTRT Productivity***	***Integrated A/P Risk***	***Natural Processes Risk***	***Diversity Risk***	***Integrated SS/D Risk***	
1990-2004	3000	2208 (905–5163)	1.28	Moderate	Low	Moderate	Moderate	Maintained
1985-2004			1.07	Moderate				

In the Clearwater River basin, known spawning range of SR fall Chinook salmon has recently extended further upstream (Arnsberg *et al.* 2015). Recent surveys (Arnsberg *et al.* 2013, 2014, 2015) show that fall Chinook spawn at least sporadically in the area between the North Fork to the SFCR confluence, in the Middle Fork Clearwater and Selway Rivers, and in the SFCR. Redds surveyed in the SFCR have increased from zero in 2007 to 119 in 2015.

The largest redd count, in 2015, was a total of 119 redds from the mouth of the SFCR to about 24.4 miles upstream. Nearly half (53) of the redds counted in 2015 were between Harpster and the Mt. Idaho Grade road, which is near or within the action area. Fall Chinook spawning is documented in the SFCR up to about river mile 24.4 (NPT 2015), which is upstream of the lower bound of the action area (about river mile 15.5). The NPT operates an acclimation facility which releases hatchery-reared juvenile fall Chinook salmon about 7 miles downstream of the lower portion of the project reach (Arnsberg *et al.* 2015). More information on fall Chinook salmon in the action area is included in Section 2.3.

2.2.1.2 Snake River Basin Steelhead

The SRB steelhead was listed as a threatened ESU on August 18, 1997 (62 FR 43937), with a revised listing as a DPS on January 5, 2006 (71 FR 834). This DPS occupies the SRB, which drains portions of southeastern Washington, northeastern Oregon, and north/central Idaho. Reasons for the decline of this species include substantial modification of the seaward migration corridor by hydroelectric power development on the Snake and mainstem Columbia Rivers, and widespread habitat degradation and reduced streamflows throughout the SRB (Good *et al.* 2005). Another major concern for the species is the threat to genetic integrity from past and present hatchery practices, and the high proportion of hatchery fish in aggregate run of SRB steelhead over Lower Granite Dam (Good *et al.* 2005; Ford 2011). On August 15, 2011, in the agency's most recent 5-year review for the SR DPS, NMFS concluded that the species should remain listed as threatened (76 FR 50448).

Life History. Adult SRB steelhead enter the Columbia River from late June to October to begin their migration inland. After holding over the winter in larger rivers in the SRB, steelhead disperse into smaller tributaries to spawn from March through May. Earlier dispersal occurs at lower elevations and later dispersal occurs at higher elevations. Juveniles emerge from the gravels in 4 to 8 weeks, and move into shallow, low-velocity areas in side channels and along channel margins to escape high velocities and predators (Everest and Chapman 1972). Juvenile steelhead then progressively move toward deeper water as they grow in size (Bjornn and Rieser 1991). Juveniles typically reside in fresh water for 1 to 3 years, although this species displays a wide diversity of life histories (Busby *et al.* 1996). Smolts migrate downstream during spring runoff, which occurs from March to mid-June depending on elevation, and typically spend 1 to 2 years in the ocean.

Steelhead can spawn more than once and adults may return to the ocean after spawning. Repeat spawning rates for steelhead are highly variable (e.g., range from under one percent to over 50% in the Pacific Northwest) and are regulated by several biological, ecological, and anthropogenic factors (Busby *et al.* 1996). Under natural conditions these fish would swim back downstream to the Pacific Ocean to feed and restore depleted energy reserves before attempting to spawn again. In 1999 the Yakama Nation and the Columbia River Inter-Tribal Fish Commission partnered on a project to capture these fish in the spring as they start back downstream and "recondition" them in hatchery facilities home basins (e.g., Clearwater River, Yakima River, Methow River). The Nez Perce Tribe captures kelts at Lower Granite Dam from March through June for reconditioning at the Dworshak National Fish Hatchery before release back into the SRB in the late fall so they can spawn again the following spring.

Spatial Structure and Diversity. This species includes all naturally-spawning steelhead populations below natural and manmade impassable barriers in streams in the SRB of southeast Washington, northeast Oregon, and Idaho, as well as the progeny of six artificial propagation programs (71FR834). The hatchery programs include Dworshak National Fish Hatchery, Lolo Creek, North Fork Clearwater River, East Fork Salmon River, Tucannon River, and the Little Sheep Creek/Imnaha River steelhead hatchery programs. The SRB steelhead listing does not include resident forms of *O. mykiss* (rainbow trout) co-occurring with steelhead.

The ICBTRT identified 24 extant populations within this DPS, organized into five major population groups (MPGs) (ICBTRT 2003). The ICBTRT also identified a number of potential historical populations associated with watersheds above the Hells Canyon Dam complex on the mainstem SR, a barrier to anadromous migration. The five MPGs with extant populations are the Clearwater River, Salmon River, Grande Ronde River, Imnaha River, and lower SR. In the Clearwater River, the historic North Fork population was blocked from accessing spawning and rearing habitat by Dworshak Dam. Current steelhead distribution extends throughout the DPS, such that spatial structure risk is generally low. For each population in the DPS, Table 4 shows the current risk ratings that the ICBTRT assigned to the four parameters of a VSP (spatial structure, diversity, abundance, and productivity).

The SRB steelhead DPS exhibit a diversity of life-history strategies, including variations in fresh water and ocean residence times. Traditionally, fisheries managers have classified SRB steelhead into two groups, A-run and B-run, based on ocean age at return, adult size at return, and migration timing. A-run steelhead predominantly spend 1-year at sea and are assumed to be associated with low to mid-elevation streams in the SRB. The B-run steelhead are larger with most individuals returning after 2 years in the ocean. The ICBTRT has identified each population in the DPS as either A-run or B-run. Initial results from new research, however, indicate that some populations in the SRB assumed to be either A-run or B-run may support a mixture of the two run types (Ford 2011). Maintaining life history diversity is important for the recovery of the species.

Diversity risk for the DPS is low to moderate, and drives the moderate combined spatial structure/diversity risks shown in Table 4 for some populations. Moderate diversity risks for some populations are caused by the high proportion of hatchery fish on natural spawning grounds. Reductions in hatchery-related diversity risks would increase the likelihood of these populations reaching viable status.

Abundance and Productivity. Historical estimates of steelhead production for the entire SRB are not available, but the basin may have supported more than half the total steelhead production from the Columbia River basin (Mallet 1974, as cited in Good *et al.* 2005). Historical estimates do exist for portions of the basin. Estimates of steelhead passing Lewiston Dam (removed in 1973) on the lower Clearwater River were 40,000 to 60,000 adults (Ecovista *et al.* 2003). Based on relative drainage area, the Salmon River basin likely supported substantial production as well (Good *et al.* 2005). In contrast, at the time of listing, the 5-year (1991 to 1996) mean abundance for natural-origin steelhead passing Lower Granite Dam was 11,462 adults (Ford 2011). Steelhead passing Lower Granite Dam include those returning to: (1) The Grande Ronde and Imnaha Rivers in Oregon; (2) the Asotin Creek in Washington; and (3) the Clearwater and Salmon Rivers in Idaho. A more recent 5-year (2003 to 2008) mean abundance passing Lower Granite Dam was larger at 18,847 natural-origin fish (Ford 2011). These natural-origin fish represent just 10% of the total steelhead run over Lower Granite Dam of 162,323 adults for the same time period. However, a large proportion of these fish return to the hatcheries or are removed by selective harvest prior to reaching spawning areas, such that the relatively high hatchery proportions in the aggregate run over Lower Granite Dam are not representative of the proportions in spawning escapements into most population-level tributaries (Ford 2011). Natural-origin steelhead returns to the SR (counted July 1 through June 30 of the following year) have further increased in recent years with Lower Granite Dam counts of 44,239 returning natural-origin adults in 2009 to 2010; 44,839 in 2010 to 2011; 40,151 in 2011 to 2012; and 26,173 in 2012 to 2013 (ODFW and WDFW 2014).

Despite recent increases in steelhead abundance, population-level natural-origin abundance and productivity inferred from aggregate data indicate that many populations in the DPS are likely below the viability targets necessary for species recovery (Ford 2011). Population-specific abundance estimates are not available for most SRB steelhead populations. Instead, the ICBTRT estimated average population abundance and productivity using annual counts of natural-origin steelhead passing Lower Granite Dam, generating separate estimates for a surrogate A-run and B-run population. Most population A/P risks shown in Table (7) are based on a comparison of the surrogate population current abundance and productivity estimates to a population viability threshold of 1,000 natural-origin spawners and a productivity of 1.14 recruits per spawner. The surrogate A-run population has a mean abundance of 556 spawners and productivity of 1.86, indicating a moderate A/P. The surrogate B-run population has a mean abundance of 345 spawners and productivity of 1.09, indicating a high A/P risk (ICBTRT 2010, Appendix B-1). Based on these tentative risk ratings, all populations except for one are currently at either high or moderate risk of extinction over the next 100 years. Joseph Creek in Oregon, for which population-specific abundance information is available, is the only population in the DPS currently rated as viable (Ford 2011).

Table 4. Summary of VSP parameter risks and overall current status for each population in the Snake River Basin steelhead DPS (Ford 2011).

MPG	Population	VSP Parameter Risk		Overall Viability Rating
		Abundance/ Productivity	Spatial Structure/ Diversity	
Lower Snake River	Tucannon River	High	Moderate	High Risk?[1]
	Asotin Creek	Moderate	Moderate	High/Moderate Risk?
Grande Ronde River	Lower Grande Ronde		Moderate	Moderate Risk?
	Joseph Creek	Very Low	Low	Highly Viable
	Wallowa River	High	Low	High Risk?
	Upper Grande Ronde	Moderate	Moderate	Moderate Risk
Imnaha River	Imnaha River	Moderate	Moderate	Moderate Risk
Clearwater River (Idaho)	Lower Mainstem Clearwater River	Moderate	Low	Moderate Risk?
	South Fork Clearwater River	High	Moderate	High Risk?
	Lolo Creek	High	Moderate	High Risk?
	Selway River	High	Low	High Risk?
	Lochsa River	High	Low	High Risk?
	North Fork Clearwater River			Extirpated

MPG	Population	VSP Parameter Risk		Overall Viability Rating
		Abundance/ Productivity	Spatial Structure/ Diversity	
Salmon River (Idaho)	Little Salmon River	Moderate	Moderate	Moderate Risk?
	South Fork Salmon River	High	Low	High Risk?
	Secesh River	High	Low	High Risk?
	Chamberlain Creek	Moderate	Low	Moderate Risk?
	Lower Middle Fork Salmon River	High	Low	High Risk?
	Upper Middle Fork Salmon River	High	Low	High Risk?
	Panther Creek	Moderate	High	Moderate Risk?
	North Fork Salmon River	Moderate	Moderate	Moderate Risk?
	Lemhi River	Moderate	Moderate	Moderate Risk?
	Pahsimeroi River	Moderate	Moderate	Moderate Risk?
	East Fork Salmon River	Moderate	Moderate	Moderate Risk?
	Upper Mainstem Salmon River	Moderate	Moderate	Moderate Risk?
Hells Canyon	Hells Canyon Tributaries			Extirpated

[1]The question mark indicates that information on the population size is incomplete.

South Fork Clearwater Population. The South Fork Clearwater steelhead population is one of five extant, and one extirpated, populations in the Clearwater River MPG (NMFS 2015b). The ICBTRT example recovery scenario for this MPG includes achieving viable status in the Lower Mainstem Clearwater population (large size) and two out of the following three populations: Lochsa, Selway, and South Fork Clearwater. At least maintained/moderate risk status must be achieved in the populations that do not achieve viable status. The South Fork Clearwater population is one of three intermediate-sized populations, two of which must achieve viable status. The South Fork Clearwater population’s habitat has been more impacted by land uses than the other intermediate populations and a state highway runs along much of the mainstem. The South Fork Clearwater also has a higher degree of hatchery fish influence than the other intermediate-sized populations. In the draft Snake River Recovery Plan (NMFS 2015b), the initial objective status for the South Fork Clearwater population is Maintained, with only a moderate risk of extinction over a 100-year period.

The ICBTRT classified the South Fork Clearwater population as intermediate in size and complexity based on historical habitat potential (ICBTRT 2007). A steelhead population classified as intermediate must have a mean minimum abundance threshold of 1,000 natural-origin spawners to achieve five percent or less risk of extinction over a 100-year timeframe to be considered “viable.” The Idaho populations of SR steelhead do not have direct estimates of annual spawning escapements. The surrogate population for B-run steelhead above Lower Granite Dam has an estimated recent abundance of 345 and productivity of 1.09. Currently, the South Fork Clearwater population is rated at high risk due to estimated low abundance and productivity based on the surrogate population. There is substantial uncertainty in the A/P estimate due to insufficient data (Ford *et al.* 2011).

The South Fork Clearwater population has three major spawning areas (Upper South Fork, Newsome, and American) and four minor spawning areas (Mill, Meadow, Johns, and Tenmile), and this extensive spawning structure provides inherent protection against extinction. Current spawning is widely distributed throughout the population and has been documented in all larger tributaries and mainstem SFCR (ICBTRT 2007; NMFS 2015b). The population's spatial structure score is therefore low risk. A low spatial structure risk is adequate for the population to have the potential to attain its overall desired status.

For the South Fork Clearwater, diversity risk is primarily driven by the long history of outplanting hatchery steelhead into this population. Steelhead fry, fingerlings, smolts and adults have been released into the population since at least 1969. The Clearwater Hatchery releases a total of 840,000 steelhead smolts at five locations in the South Fork Clearwater drainage to: the Crooked River (83,000 smolts), Red River (150,000 smolts), Red House Hole in the mainstem South Fork Clearwater (260,000 smolts), Peasley Creek (250,000 smolts) and Newsome Creek (100,000 smolts) each year (IDFG 2012). In recent years, unclipped hatchery steelhead smolts were released for supplementation purposes, and these releases are expected to continue into the near-term. The contribution of supplementation releases and unharvested marked hatchery fish to natural production is unknown, but the duration of supplementation releases and the potential for the naturally spawning population to consist of a high proportion of hatchery-origin fish creates diversity risk, leading to a cumulative diversity risk of Moderate. Although the South Fork Clearwater population is currently at high risk due to other VSP parameter risk ratings, the population can reach its desired status with a diversity risk of moderate.

The South Fork Clearwater steelhead population is currently at high risk overall due to a tentative high risk rating for A/P, based on the ICBTRT's average surrogate B-run population passing Lower Granite Dam. In the absence of population-specific data, we assume that improvements in A/P will need to occur for this population to reach its minimum necessary status of maintained, with moderate risk of extinction. Of particular concern is an overall high risk rating for the remaining Clearwater River MPG populations, none of which are currently viable.

Limiting factors for the South Fork Clearwater population are habitat related and are described below in Section 2.2.2.

2.2.2 Status of Designated Critical Habitat

The entire action area of the SFCR is designated critical habitat for SRB steelhead. Designated critical habitat for SR fall Chinook salmon includes the Clearwater River upstream to the confluence with Lolo Creek and does not overlap with the action area. Generally, sites required to support one or more life stages of an ESA-listed species (i.e., sites for spawning, rearing, migration, and foraging) contain PBFs essential to conservation of that listed species (e.g., spawning gravels, water quality and quantity, side channels, or food: Table 5).

The steep population declines that preceded the ESA listings of each of the ESUs and DPSs described in Section 2.2.1 occurred with construction and operation of hydropower dams in the Columbia and Snake Rivers (Raymond 1979). In addition, population declines can be attributed to the reduction of river flows from consumptive use by irrigated agriculture throughout the Columbia River and its tributaries. Habitat loss from impassable dams, and streams dried in whole or in part by water withdrawals, sediment, and artificial passage barriers account for most of the losses of freshwater habitat for SR salmon and steelhead (Lee *et al.* 1997). Effects of forestry, mining, roads, urbanization, and agriculture have reduced the quality of much of the remaining salmon and steelhead habitat outside roadless areas (Lee *et al.* 1997; McIntosh *et al.* 1994).

Table 5. Types of sites, essential PBFs, and the species life stage each PBF supports.

Site	Physical and Biological Features	ESA-listed Species Life Stage
Snake River Basin Steelhead[a]		
Freshwater spawning	Water quality, water quantity, and substrate	Spawning, incubation, and larval development
Freshwater rearing	Water quantity & floodplain connectivity to form and maintain physical habitat conditions	Juvenile growth and mobility
	Water quality and forage[b]	Juvenile development
	Natural cover[c]	Juvenile mobility and survival
Freshwater migration	Free of artificial obstructions, water quality and quantity, food, and natural cover[c]	Juvenile and adult mobility and survival

[a] Additional PBFs pertaining to estuarine, nearshore, and offshore marine areas have also been described for SRB steelhead. These PBFs will not be affected by the proposed action and have therefore not been described in this Opinion.
[b] Forage includes aquatic invertebrate and fish species that support growth and maturation.
[c] Natural cover includes shade, large wood, log jams, beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks.
[d] Food applies to juvenile migration only.

All of the essential physical and biological features (designated as PBFs) listed in Table 5 have been reduced in function in some or most areas of the range of the SRB steelhead DPS included in this Opinion. Hydropower dams and reservoirs associated with the Federal Columbia River Power System (FCRPS) have eliminated or altered PBFs of mainstem rearing habitat and have altered the natural flow regime of the Snake and Columbia Rivers, decreased spring and summer flows, increased fall and winter flows, and altered natural thermal patterns and PBFs (NMFS 2008a, 2008b, 2014a). The eight Snake and Columbia River dams kill or injure a portion of the smolts passing through the migration corridor area, and the dams create artificial conditions favorable for salmon and steelhead predators, such as terns, sea lions, seals, and piscivorous fish (i.e., walleye, bass, catfish, and northern pikeminnow), and introduced competitors (Zimmerman

1999). The low velocity movement of water through the reservoirs behind the dams slows the smolts' journey to the ocean and enhances the survival of predatory fish (ISG 1996; NRC 1996). Changes in the operation and modifications to the FCRPS dams in the last decade have reduced some adverse effects of the dams; however, these dams/reservoirs continue to kill or harm a sizable number of steelhead juveniles and adults, and migration PBFs remain degraded.

The water quality, substrate, riparian vegetation, forage and cover PBFs that support freshwater spawning, rearing, and migration life stages of steelhead are impaired by agriculture, logging, mining, navigation, transportation, and urban development. Urban and agricultural runoff, irrigation return flows, as well as municipal and industrial wastewater outflows have increased water temperatures and introduced high levels of sediment and other pollutants, which degrade PBFs water quality, substrate, forage, and cover PBFs. Habitat has been lost or severely damaged in tributary streams by reduction of flows, construction and operation of irrigation dams, channelization of streams, removal of riparian vegetation, and other activities generally associated with farming, ranching, mining, logging, transportation, and other development.

For the SRB steelhead DPS considered in this Opinion, critical habitat of the SFCR must support year-round rearing and movement of juvenile steelhead and late winter to late spring holding, spawning, and movement of adult steelhead. The quality of water and substrate are important to rearing and migrating juveniles for cover, shade, forage production, and growth. Water and substrate quality are important to adult steelhead for cover, thermal refugia, and conserving energy during migration, holding, and spawning. Incubating eggs and alevins require adequate water and sediment quality for cover and stable space within substrates, thermal refugia, and oxygenated incubation. Steelhead PBFs most likely to be affected by the proposed action are water quality, substrate, forage, cover, space and safe passage (Table 5).

To determine the habitat limiting factors for the SFCR steelhead population, NMFS reviewed multiple data sources and reports on stream conditions when formulating the SRB steelhead Recovery Plan (NMFS 2015b). Based on reports and discussions with local fisheries experts and watershed groups, it was concluded that the habitat limiting factors for the South Fork Clearwater steelhead population are riparian conditions, elevated stream temperatures, migration barriers, sediment, and habitat complexity. Table 6 summarizes the mechanisms by which each limiting factor affects steelhead, and management objectives for addressing each limiting factor.

Table 6. Primary limiting factors identified for the South Fork Clearwater River steelhead population, mechanisms by which each limiting factor affects salmonids, and management objectives for addressing each limiting factor.

Limiting Factors	Effects on Salmonids	Management Objectives to Address Limiting Factors
Riparian and Floodplain Conditions	Poor riparian conditions reduce habitat quality, streambank stability (sediment and channel condition), shade (stream temperature), and LWD recruitment (habitat complexity and pool formation). Disconnection of main channels from the floodplain and side channel leads to less available habitat.	Revegetation of riparian areas. Reconnection of floodplains and side channels.
Temperature	High stream temperatures affect salmonid growth and development, alter life history patterns, induce disease, or exacerbate competitive predator-prey interactions. High stream temperature can also be lethal to both adult and juvenile salmon.	Riparian restoration actions to improve shade and stream cover to reduce stream temperature. Reduce sedimentation.
Migration Barriers	Migration barriers such as dams, culverts, and dewatered stream sections can create fish passage barriers. These barriers reduce or eliminate movement of adult and juvenile salmon within a watershed ultimately reducing potential spawning and rearing habitat.	Correction or removal of fish passage barriers
Sediment	Excess sediments can reduce juvenile habitat (rearing), aquatic insect availability (food), and spawning and incubation success (reproduction).	Riparian restoration actions to stabilize streambanks and reduce sedimentation to the stream. Reduction of sediment delivery to streams from roads, mining, timber harvest.
Habitat Complexity	Reduced habitat quality as measured by pools frequency, pool quality, and sufficient LWD reduces juvenile rearing and adult holding and spawning.	Restoration of riparian vegetation to increase LWD recruitment to streams over time. Reconnection of floodplains.

Legacy placer and dredge mining have reduced the conservation value of critical habitat PBFs through the action area. The channel is generally simple, flat, and its substrates loaded with fine sediment and sand. Almost the entire SFCR floodplain and north bank are narrowed and armored by roads, which reduce riparian vegetation, undercut banks, food, and cover.

2.2.3 Climate Change

One factor affecting the rangewide status of ESA-listed salmon and steelhead, and aquatic habitat at large is climate change. Several studies have revealed that climate change has the potential to affect ecosystems in nearly all tributaries throughout the Pacific Northwest (Battin *et al.* 2007; ISAB 2007; Isaak et al. 2012). While the intensity of effects will vary by region (ISAB 2007), climate change is generally expected to alter aquatic habitat (water yield, peak flows, and stream temperature). As climate change alters the structure and distribution of rainfall, snowpack, and glaciations, each factor will in turn alter riverine hydrographs. Given the increasing certainty that climate change is occurring and is accelerating (Battin *et al.* 2007), NMFS anticipates salmonid habitats will be affected. Climate and hydrology models project significant reductions in both total snow pack and low-elevation snow pack in the Pacific Northwest over the next 50 years (Mote and Salathé 2009). Those changes will shrink the extent of the snowmelt-dominated habitat available to salmon and may restrict our ability to conserve diverse salmon life histories.

In the Pacific Northwest, most models project warmer air temperatures, increases in winter precipitation, and decreases in summer precipitation. Average temperatures in the Pacific Northwest are predicted to increase from 0.1 to 0.6ºC (32.18 to 33.09ºF) per decade (Mote and Salathé 2009). Warmer air temperatures will lead to more precipitation falling as rain rather than snow. As the snow pack diminishes, seasonal hydrology will shift to more frequent and severe early large storms, changing stream flow timing and increasing peak river flows while lowering summer and fall base flows, which may limit salmon survival (Mantua *et al.* 2010).

Higher water temperatures and lower rearing and migration flows, together with increased magnitude of winter peak flows are all likely to increase salmon and steelhead mortality. The Independent Scientific Advisory Board (2007) noted that higher ambient air temperatures will likely cause water temperatures to rise. Salmon and steelhead require cold water for spawning, incubation, rearing, and migration. As climate change progresses and stream temperatures warm, thermal refugia will be essential to persistence of many salmonid populations. Thermal refugia are important for providing salmon and steelhead with patches of suitable habitat while allowing them to undertake migrations through or to make foraging forays into areas with greater than optimal temperatures. To avoid waters above summer maximum temperatures, juvenile rearing may be increasingly found only in rivers with intact flows or in the confluence of colder tributaries or other areas of cold water refugia (Mantua *et al.* 2010).

Climate change is expected to make recovery targets for salmon populations more difficult to achieve. Climate change is expected to alter critical habitat by generally increasing temperature and peak flows and decreasing base flows. Although changes will not be spatially homogenous, effects of climate change are expected to decrease the capacity of critical habitat to support successful spawning, rearing, and migration. Habitat action can address the adverse impacts of climate change on salmon. Examples include restoring connections to historical floodplains and freshwater and estuarine habitats to provide fish refugia and areas to naturally store excess floodwaters, protecting and restoring riparian vegetation and base flows to ameliorate stream temperature increases, and purchasing or applying easements to water and lands that provide important cold water or refuge habitat (Battin *et al.* 2007; ISAB 2007).

2.3 Environmental Baseline

The "environmental baseline" includes the past and present impacts of all Federal, state, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of state or private actions which are contemporaneous with the consultation in process (50 CFR 402.02).

The South Fork and Middle Fork Clearwater Rivers are major tributaries that confluence to form the Clearwater River just west of the town of Kooskia in north-central Idaho. Most of the South Fork Clearwater drainage is forested and owned by the FS/BLM. Timber harvest, wildfire, roads, and livestock grazing impact most of the drainage and contribute to increased sediment loads and warmer water temperatures in the SFCR (Ecovista *et al.* 2003). Highway runs the length of the SFCR and has constricted the floodplain and sloped or hardened many areas of northern bank along the SFCR. Roads throughout the drainage, primarily for timber harvest, exceed 3 to 5 miles per square mile (Wilmer 2011) and contribute large amounts of sediment to the SFCR. Mining was historically a major land use, and the South Fork has the most extensive history of placer mining of any area in the Clearwater River Basin. Major tributary systems were dredged, and hydraulic mining was common throughout the SFCR mainstem. Increased sedimentation, stream channelization, reduced instream cover, and riparian degradation have occurred in areas where mining, logging, and road building has occurred.

The South Fork Clearwater drainage has a complex mining history, including periods of intense placer, dredge, and hydraulic mining (Ecovista *et al.* 2003). Gold has been placer-mined in the SFCR since its discovery in the 1860s. Early mining operations mostly involved shovels and sluice boxes, but Idaho Department of Environmental Quality (IDEQ) and EPA (2003) report that large-scale hydraulic and dredge mining began around 1900 in the SFCR and its tributaries (primarily Newsome Creek, American River, Red River, and Crooked River). A lull in large-scale mining in the SFCR drainage occurred between about 1910 and 1930, but in 1930, large-scale mining projects resumed and continued through the late 1950s (IDEQ and EPA 2003). Effects of past placer mining and extensive dredge spoils are still evident in tributaries (e.g., lower Crooked River). Clusters of mines with high ecological hazard ratings are located in the SFCR drainage (Ecovista *et al.* 2003). More recent mining has generally been with suction dredges to prospect and process instream gravels that previously could not be reached (Stewart and Sharp 2003). Unpermitted and unmitigated suction dredging occurred in the SFCR and some tributaries during summers of 2014 and 2015, and at some sites damage to banks and other habitats may still be visible (Kenney 2016). While numbers of prospectors varies from year to year, miners currently have 24 placer claims on the project reach of the SFCR.

The SFCR has been on the 303d list for elevated temperature and coarse sediment loads that impair water quality (IDEQ 1998, 2011). The SFCR Total Maximum Daily Load (TMDL; (IDEQ and EPA 2003) requires that riparian vegetation be protected to increase shade lost by logging, road building, mining, grazing, wildfires, and (agriculture along the lower SFCR) and thereby help reduce temperatures. Maximum daily water temperatures of the SFCR during summers of 2013 and 2014 averaged between 19 to 21ºC (66 to 70ºF) for most of action area (Dobos 2015). In the action area, the middle reach was generally cooler, the upper reach was warmer, and the lowest reach near Harpster Grade and the lower boundary of the action area was warmest, with average maximum temperatures during July and early August reaching 23ºC (73ºF) (Dobos 2015). Further downstream at a U.S. Geological Survey (USGS) gaging station near Stites, Idaho, average July water temperatures between 1998 and 2008 were 21ºC (70ºF), increasing to 23ºC (73ºF) during periods of low flows (<400 cubic feet per second [cfs]). August average water temperatures varied little and were typically 20.5ºC (69ºF). Warm summer water temperatures limit functioning rearing habitat, causing juvenile salmonids to rely more on limited areas of thermal refugia, complex cover, and shade and is another stressor that can limit growth and survival and exacerbate adverse effects of sedimentation.

From 1965 to 2014, highest monthly average flows occurred during May (3,164 cfs) and June (2,441 cfs), July flows declined rapidly to 759 cfs, and lowest monthly average flows occurred from August to October (about 250 cfs). Average high flows during snowmelt runoff are about 12 times greater than those during summer-winter baseflows.

In forested areas of the upper SFCR, sediment production was estimated to be about two times more than natural background rates, so reduced or limited loads were allocated by the TMDL among sources, including suction dredge mining as a point source (IDEQ and EPA 2003). Sediment condition in the SFCR is likely slowly improving with more years of reduced mining activity, road closures, improved timber harvest and road construction practices, and numerous tributary restoration projects (i.e., the Crooked River channel restoration). However, disturbances still occur across large proportions of the watershed that degrade upland habitat, add sediment to streams, and reduce instream cover (Ecovista *et al.* 2003).

Presence of Species and Critical Habitat. Slow-water margins and banks of the SFCR are important nursery areas for subyearling steelhead. Older juvenile steelhead rear in many mainstem habitats dispersed throughout the action area. A number of natal tributaries flow into the SFCR throughout the action area, such as the American, Red, Crooked, and Newsome Rivers, and other smaller streams. Throughout the year, pulses of fry, parr, and migrating smolts use lower tributaries, their mouths, and banks of the SFCR for rearing and dispersal. Steelhead juveniles rear and migrate and adults migrate to and from spawning areas and tributaries.

Steelhead adults migrate upstream and downstream through the SFCR before and after spawning and hold or stage for extended periods in deeper pools from late winter through late spring. Adults spawn throughout the SFCR mainstem and tributaries during spring. Most spawning occurs from March through May with some into early June but ends quickly with waning runoff and warming temperatures. Most eggs hatch and fry disperse from redds during May and June, with the latest developing faster in warmer temperatures and emerging in early July.

Although critical habitat is not designated for fall Chinook salmon in the SFCR, they are documented to be present in the lower 10 miles of the action area (up to river mile 24.4; Arnsberg *et al.* 2015) and use many of same habitat features as steelhead. Fall Chinook adults migrate upstream, hold/stage, and spawn during fall. Their eggs incubate in redds over winter, and subyearlings emerge, rear, and migrate downstream through lower reaches of the action area by late spring. Fall Chinook adults often spawn and juveniles migrate and rear along relatively shallow and slower-velocity channel margins and shorelines.

Tributaries are typically cooler than the SFCR during summer (Figure 2). Water temperatures increase each summer as runoff declines and air temperatures increase. Tributaries cool down the mainstem along its course. Their cooler water does not immediately mix with the entire flow of the mainstem, but rather is pressed along the near bank for considerable distance downstream (IDEQ 2001). Tributaries also provide underflow or groundwater to the SFCR that is cooler and more stable during summer. Salmonid redds are often placed near or below tributary mouths due to cooler underflow (Geist and Dauble 1998). The entire tributary mouth and plume area provide thermal refugia, food (drift and small fish), and new gravel bars for spawning. Fish may concentrate to hold, stage, migrate, spawn, and rear in these areas. Fish moving in and out of tributary mouths must also navigate shallower deltas and confined channels, which likely increases risk of predation. Most movement by steelhead occurs at night or low light. Tributary confluences are critical, unique from other habitat, and are used year-round by salmonids.

Adult weirs and juvenile screw traps in major tributaries show that steelhead move in and out of tributaries and the mainstem nearly year-round. Pit tag data show juvenile salmonids are trapped (and tagged) moving downstream out of tributaries much of the year, although movement slowed mid-July through early August (Figure 3). Later detections of tagged juvenile steelhead indicate these fish continue rearing throughout the SFCR or migrate downstream at variable rates to the Pacific Ocean. Adult weirs or pit tag detection arrays in some tributaries show most adult steelhead moving in and out of spawning tributaries from February to mid-June.

Juvenile steelhead of different ages are well distributed throughout the SFCR action area (Dobos 2015). Snorkelers observed juvenile steelhead at 68% of 62 snorkel stations throughout the entire SFCR mainstem during August 2014 (Dobos 2015). Overall average density of juvenile steelhead was relatively high (1.9 fish/100 per square meters). Highest densities were observed throughout the narrower, rockier, and steeper reaches downstream from Newsome Creek, and lowest densities were observed in the wider and sandier channel upstream from Newsome Creek (Dobos 2015). Adult steelhead holding and staging pools are prevalent in the narrower and rockier reaches downstream of Newsome Creek. A survey during spring 2015, observed steelhead redds in small clusters throughout the SFCR (IDFG 2015).

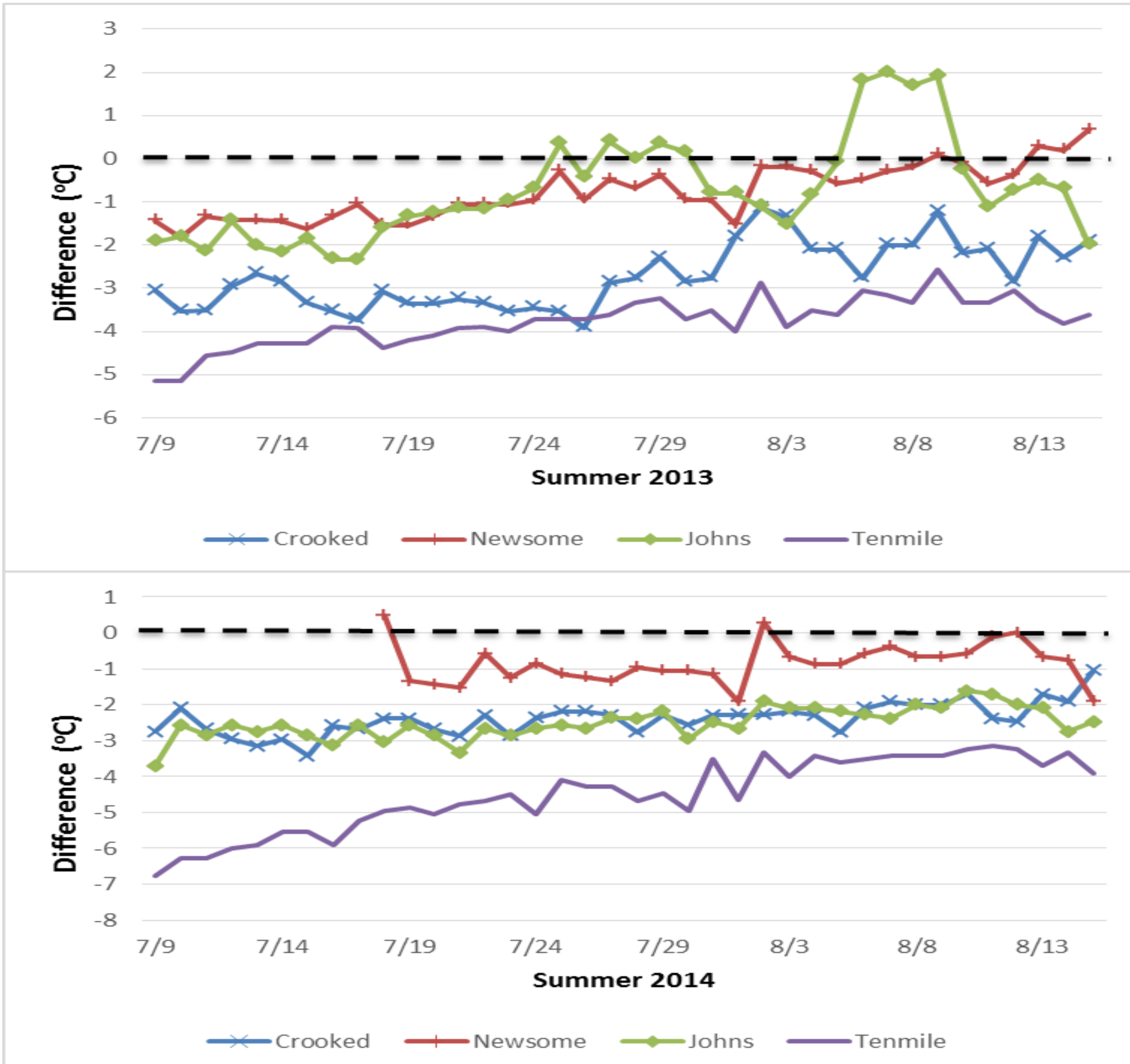

Figure 2. **Differences in daily maximum water temperature between major tributaries and the warmer SFCR mainstem upstream of each tributary mouth during summers 2013 and 2014 (from Dobos 2015).**

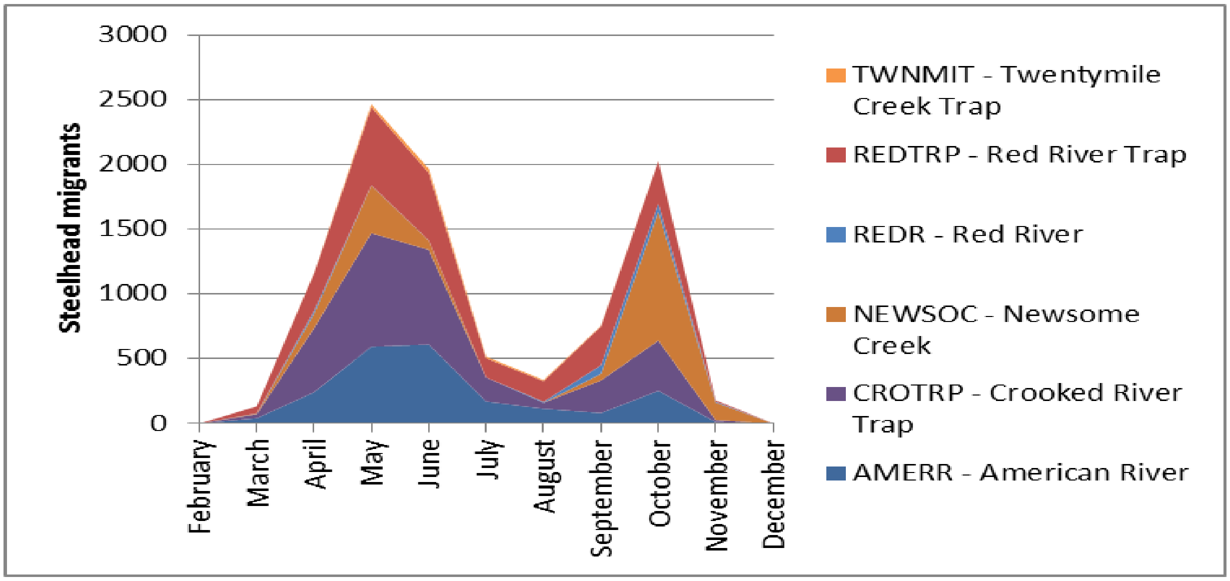

Figure 3. Simple counts of fish tagged at screw traps indicate steelhead juveniles commonly moved into the SFCR from its tributaries throughout the year, with peaks during spring and fall. Subyearlings and older juveniles may migrate through or reside for 1 to 4 years in the SFCR mainstem.

2.4 Effects of the Action

Under the ESA, "effects of the action" means the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline (50 CFR 402.02). Indirect effects are those that are caused by the proposed action and are later in time, but still are reasonably certain to occur.

2.4.1 Effects on Listed Species

This section describes the effects of proposed recreational suction-dredge mining activities in the SFCR on individual fish. Analysis includes three primary components: exposure, response, and risk characterization. Exposure and response are analyzed then integrated in the risk characterization phase. Impacts to designated critical habitat are analyzed separately and then overall risk is integrated and synthesized. We then evaluate consequences of those effects on the viability of the SR fall Chinook ESU and SRB steelhead DPS.

The timing of mining activities during summer limits exposure of very young steelhead, the majority of which will likely have already emerged from redds. Fall Chinook salmon spawn during fall, fry emerge during late winter and early spring, and most subyearlings will have migrated downstream out of the action area well before July 15. During the mining season juvenile steelhead from subyearlings to 4 years of age will rear and migrate throughout the action area, depend on forage production for growth, and use spaces underneath banks and substrate for cover from predation. Adult Chinook and steelhead will not likely be present in the action area when mining occurs.

Mining operations are reasonably certain to expose juvenile steelhead to small-scale daily disturbances within a month-long season. Potential effects include physical contact with dredges and moving substrates, turbidity, fuel and sediment contaminants, various substrate alterations, and small reductions in cover and forage.

2.4.1.1 Direct and Indirect Effects to Fish

Physical contact in redds and post emergence. The precise timing of steelhead spawning and emergence of juveniles from redds varies among locations and years and is not known for the SFCR. Pit-tagged adult steelhead have been trapped or otherwise detected in SFCR tributaries as late as June 15, but those fish probably spawned in the tributary in which they were detected. Given this limited data, the analysis estimating fry emergence dates for Lolo Creek (NMFS 2013; Appendix A) is appropriate as a conservative surrogate for estimating SFCR fry emergence. In this analysis, the latest spawning date was assumed as June 1 and coldest temperatures were used to estimate the latest date that fry would emerge from redds. This analysis indicates that 80% fry emergence will occur by mid-July most years, but that in a few colder years fry emergence could extend into late July (Appendix A). The proposed dredging season is likely to begin well after the vast majority of steelhead fry emerge from the gravels in years with warm or moderate temperatures, but some very young fish may still be dependent upon hiding in substrates at the beginning of dredge mining season if the spring is unseasonably cold.

Stepping on or excavating occupied redds could directly kill eggs and very young fish if dredging were to occur in areas where redds are located. Trampling effects are most severe during the latter stages of alevin incubation when they are closest to the gravel surface. Entrainment-induced mortality is also pronounced for salmonid sac fry; Griffith and Andrews (1981) reported an 83% mortality rate of sac fry after entrainment through a 2.5-inch dredge. Of all life-stages, un-eyed eggs are probably the most susceptible to damage from entrainment through dredges. Griffith and Andrews (1981) reported 100% mortality of un-eyed cutthroat trout eggs after entrainment. The pump intake is required to be screened to prevent entrainment and impingement of steelhead fry, but the nozzle is not screened, so it is possible that fry may be entrained through the dredge hose, outlet, and sluice.

Work areas proposed by miners will be adjusted by FS/BLM, prior to mining season, as needed to avoid identified redds, and early-rearing and spawning habitats that may include redds. Designating work zones as proposed virtually eliminates trampling or excavating redds, unless a redd is located in an area not recognized by biologists as a likely spawning site, or if a miner walks or operates outside their designated work zone. In previous dredging seasons on other streams within NPCNF, with similar protective measures as this proposed action, post-season monitoring found measures effectively minimized adverse effects to spawning habitat and documented only one occasion where an operator excavated a small gravel bar in a work zone that was marginally suitable for steelhead spawning (Kenney 2013, 2014).

The action area of the SFCR is lower in elevation, farther south latitude, and includes a longer and wider channel that tends to warm from solar exposure (IDEQ 2001) faster than Lolo Creek or its own tributaries, so dates of latest emergence in the mainstem SFCR are likely to be earlier on average (Appendix A). During normal years when water temperatures are not unusually cold, steelhead fry will have already emerged from redds by July 15 and there is very low risk of any occupied redds remaining in the action area. However, over a 10-year program that will likely include some cold years of high flow, it remains probable that redds occupied by eggs/alevins would be present in the action area during the work period, possible that a redd would escape identification during work site layout, and thus alevins could be buried, crushed, or excavated. Protective measures avoiding likely spawning/early-rearing habitats, tributary mouths, riverbanks, slow-flowing margins, and gravel bars at pool tails will greatly limit risk of incidence, but injury or death of a few very young fish during cold years of higher more turbid flows is expected.

Steelhead spawning locations are also relatively unknown in the SFCR because they spawn during the turbid higher flows of spring, making redds difficult to observe. Although steelhead redd surveys are not conducted, recent observations by IDFG were able to document some steelhead redd locations during short periods of relatively low flows and clearer water (IDFG 2015). Program monitoring by the FS/BLM includes coordinating information with IDFG, NPT, and others on spawning sites and patterns in the SFCR. This information should help improve spawning habitat identification in general, better assess the overlap between mining disturbance and spawning sites, and will identify specific spawning areas that can then be protected within the program. This will further minimize the risk of redds being trampled, excavated, or covered by miners.

Physical contact with rearing fish. Post emergent subyearling and 1- to 4-year old rearing juvenile steelhead will encounter miners working in the water, transporting equipment, excavating substrates, and piling sediments (Figure 4). During low flows and clear water conditions of summer, some juvenile salmonids will continue to hide from disturbances or shelter under substrates (Gries and Juanes 1998; Mesick 1988). Most fish exposed to summer season mining activity will be in main-channel areas, will be large enough to swim in faster current, and will avoid direct contact with mining operations.

Some fish may be attracted to dislodged prey, fresh cobble piles, or dredge holes, or become accustomed to the low-level disturbance, and remain near active operations (Hassler *et al.* 1986). Some juveniles hiding in the riverbed may be crushed by miners trampling, moving large rocks, piles of smaller substrates, and dragging heavy equipment in shallow water. Over a month-long season for 10 years, even protective measures of backfilling dredge holes, redistributing fine sediments, replacing cobble and smaller boulders, and re-contouring disturbed sites do not entirely counteract the risk. Risk will remain low because small amounts of substrate are moved at fairly slow rates and juvenile fish mobility is increased due to warmer water temperatures and larger size of fish at this time of year. Most fish will swim away from disturbances, avoid entrapment, and continue rearing in nearby habitat.


Figure 4. Suction dredge in SFCR during summer 2015 (photo by J. Oppenheimer).

The action also has the potential to harm or kill juvenile fish by sucking fish through dredges or against screens. Suction dredging appears to have little entrainment-related effect on parr-sized and larger salmonids because these individuals are alert and rapidly mobile, and so are capable of avoiding the dredge, however, some individuals may be entrained or impinged against screens and could suffer adverse effects. Griffith and Andrews (1981) intentionally passed 20 juvenile brook trout and 10 juvenile rainbow trout through a 2.5-inch dredge and observed no mortality during the following 48 hours. Harvey (1986) found juvenile rainbow trout observed after passage through a suction dredge showed no immediate ill effects. However, these fish were not observed for longer periods, and it remains likely that entrainment may cause stress, minor injuries, scale loss, or loss of equilibrium that lead to increased risk of predation or disease for a few individuals.

Entrainment through dredges, and covering or crushing fish hiding in substrates are likely to kill or injure a few fish over a 10-year program. Incidence will be low because by summer fish will have grown larger, spend less time in substrates in general, and are more mobile to avoid focused and slow-moving mining activity.

Fish movement. Fish rearing and moving in the action area will be exposed to suction dredging disturbance. Movements of juvenile steelhead past dredge operations could be delayed during daylight hours until instream activities cease, particularly if multiple dredges are operating nearby at the same time. However, timing and protective measures in the proposed action avoid active disturbance during spring and fall seasons of peak use and movement, and at tributary mouths, along river banks, in deep pools, and in sensitive habitats with slow currents during summer. These protective measures also preclude multiple operations in close proximity.

Young salmonids occasionally move to new territories due to factors such as different habitat requirements as fish increase in size; changes in food availability or flow at a particular site; or in response to other fish (Skoglund and Barlaup 2006, Schrank and Rahel 2006). Juvenile salmonids typically do not move to new territories on a daily basis, but rather tend to move on a scale of weeks to months. Most miners are expected to operate over an 8-hour or shorter period with several breaks during the day, allowing available corridors for fish movement within a large river channel. Migrating or moving fish can readily avoid and pass small areas of activity. Even in low flows and areas of narrower channel, mining disturbance will include only a few, dispersed, and small operations that will not operate at night. Considering these factors, the proposed action is unlikely to have any appreciable effect on juvenile steelhead movement, migration, or access.

Feeding behavior and growth. Mining disturbances could lead to interruptions and alterations in normal behavioral patterns of rearing juveniles. If daytime feeding is diminished due to mining activities for extended periods, it could reduce the growth rate of fish in a variety of ways. Smaller fish experience high rates of winter mortality (Biro *et al.* 2003), under-sized smolts have lower rates of survival to the adult stage in comparison to larger fish (Beamish and Mahnken 2001; Sogard 1997; Mebane and Arthaud 2010), and slow-growing salmonids may require an additional year or more of residence time to reach the minimum size before out-migrating as smolts (Copeland *et al.* 2009; Tattam *et al.* 2013). Although noise and movement activities could potentially have negative effects on feeding behavior, past observations made by miners, the NPCNF, and NMFS during field reviews showed fish feeding within a few feet of the activity and often in the turbidity plume itself. Others have made similar observations; Hassler *et al.* (1986) noted juvenile steelhead shifted to feed on invertebrates that had been dislodged or expelled by the dredge. Fish are likely to alter their feeding behavior during exposure to active mining, but the overall effect on growth will be small. Because the proposed dredging is restricted to daytime hours, peak twilight feeding periods will not be disrupted. Normal feeding activity and key food sources along streambanks and under riparian vegetation are protected because the proposed action prohibits mining of riverbanks and slow-velocity river margins.

Covering substrates and filling interstitial spaces with fine sediment can smother and crush forage (i.e., larger insects, small fish, and snails), force them to drift or move away, or limit their cover and increase predation (Brusven and Rose 1981). Direct contact by equipment and moving rocks can crush invertebrates and small forage fish or dislodge them and expose them to predators. Although entrainment through the dredge hose and sluice may kill very few macroinvertebrates (< one percent, Griffith and Andrews 1981), displacement causes increased predation, including from rearing salmonids (Thomas 1985; Hassler *et al.* 1986; Somer and Hassler 1992). After mining, the production of invertebrates from disturbed areas will likely be reduced for days or possibly months (Griffith and Andrews 1981; Harvey 1986; Harvey and Lisle 1998). Downstream decreases in macroinvertebrates are most likely associated with sediment deposition and substrate embeddedness below the suction dredge (Harvey *et al.* 1982; Harvey 1986; Stern 1988). Macroinvertebrate abundance and diversity was substantially reduced for about 30 feet downstream of usually larger (8-inch) suction dredges, returning to reference conditions within 300 feet downstream (Thomas 1985; Harvey 1986; Harvey and Lisle 1998; Royer *et al.* 1999; Prussian et al. 1999). Studies with smaller dredges found limited or no downstream decreases in mean macroinvertebrate abundance or diversity indices; but the composition and abundance of functional feeding groups were more commonly altered (Thomas 1985; Harvey 1986; Hassler *et al.* 1986; Somer and Hassler 1992; Harvey and Lisle 1998; Stewart and Sharp 2003).

Factors affecting prey species are likely to affect the growth of salmonids, which is largely determined by the availability of prey in freshwater systems (Mundie 1974; Beland *et al.* 2004; Johansen *et al.* 2005; Sergeant and Beauchamp 2006). Food supplementation studies have shown a clear relationship between food abundance and size on the growth rate and biomass yield of juvenile salmonids (Mason 1976; Wankowski and Thorpe 1979). Less or smaller-sized food can also induce density-dependent effects, such as slower growth and delayed migration from increased competition as prey resources are reduced (Gustafsson *et al.* 2010; Inoue *et al.* 2013). These considerations are important because juvenile growth is a critical determinant of subsequent freshwater and marine survival (Higgs *et al.* 1995; Thompson and Beauchamp 2014).

NMFS recognizes that mining disturbance reduces salmonid forage and requires time after mining for primary producers to recolonize disturbed areas and to restore previous levels of food production. There is also risk from failure of mitigation measures at some sites or unforeseen circumstances, such that disturbance is greater than anticipated. Based on past experience with unpermitted suction dredging and local suction dredging programs in Lolo Creek and smaller streams, NMFS expects that disturbed areas will remain dispersed and recover relatively quickly if the cumulative area remains low. In NMFS judgement, if the area of mainstem habitat disturbed by mining remains less than 0.4% in any year with an average rate among years that limits disturbance area to 0.2%, as is required by the proposed action, then the overall reduction of forage will not substantially limit growth of rearing salmonids.

Protective measures key to minimizing loss of cover and reductions of prey, include: not piling fine sediment on substrates more than a half-inch deep, replacing sediment into dredge holes, reclaiming sites by conforming previous contours, and limits on piling cobbles with high-percentage fines. Avoiding riverbanks and the wetted perimeter, spawning gravel bars, and slow-flowing river margins further limit degradation of critical food producing habitats. Given the dispersed and relatively small area of riverbed proposed to be disturbed and the relatively fast (within months) reinvasion rates of algae and invertebrates from immediately adjacent habitat, minor and localized reductions in primary production and forage are reasonably certain to occur in only small areas and will be associated with minor reductions in growth rates for a small number of fish.

Turbidity, sedimentation, and cover. Dredges disturb and re-suspend sediment causing turbidity at operations that is carried by current downstream in visible plumes until settling out on substrates. During active mining, turbidity and settling fines can cause adverse effects to eggs or very young fish in or near redds, ranging from behavioral effects to injury or death, depending on the length of exposure (Newcombe and Jensen 1996) or oxygen reduction (Miller *et al.* 2008). Although the vast majority of fish will have already emerged from redds and will be free-swimming fry by the July 15 opening of the dredging season and protective measures will avoid known and potential spawning areas, it is probable during colder years of high flow that settling fines from turbidity and sedimentation may adversely affect a few pre-emergent steelhead.

Each year spawning fall Chinook salmon and steelhead will encounter recently mined areas in the SFCR and may be attracted to freshly disturbed, cleaner, and unconsolidated cobbles in a silt/sand laden channel. In mainstem spawning habitats, the stability of substrates and depth of scour are critical to incubating eggs and larval fish (Montgomery *et al.* 1999; Lisle and Lewis 1992). Larger females are capable of digging deeper redds (Crisp and Carling 1989) and egg survival to emergence may be inversely related to the depth of scour during incubation (Holtby and Healey 1986). Harvey and Lisle (1999) found greater net and maximum scour for Chinook redds on dredge tailings compared to undisturbed substrates. Harvey *et al.* (1982) noted that salmonids spawned near mined areas, but redds were not observed directly on disturbed areas or tailings. There remains a small risk that survival of eggs or larval fish could be reduced in redds built in recently mined areas with unstable gravels (Montgomery *et al.* 1999) or downstream of sites with increased amounts of surface sediment that could cover or fill interstitial spaces reducing flow and oxygen (Miller *et al.* 2008). Typically, high flows the following spring and reestablishment of an anchor layer of periphyton after a few months (Grimm and Fisher 1989) will further reduce the risk. Protective measures requiring that miners avoid spawning and early-rearing habitats, along with site reclamation measures and limits on the size and number of operations and overall area of disturbance, help ensure spawning habitat alterations will be minor and temporary. The proposed action also includes monitoring to better understand the incidence of mining and spawning.

After fish emerge from redds, their ability to avoid turbidity greatly increases. Juvenile steelhead generally acquire the ability to swim against water current within several days after emergence, and swimming skills continue to improve as fish grow. Primary sublethal effects expected may include juvenile salmonid avoidance of turbid waters (Newcombe and Jensen 1996), or chronic exposure that can cause physiological stress responses which include, increased energy required for maintenance and reduced feeding and growth (Lloyd 1987).

Salmonid survival depends on many factors including food availability, predator avoidance, and immune system health and reproduction. Stressful conditions are known to reduce the adaptive responses of salmonids to natural environmental fluctuations and increase their susceptibility to disease and predation (Mesa 1994; Birtwell 1999). Information in the scientific literature regarding effects of turbidity and suspended fine sediments on fish shows a variety of results ranging from benefits of reduced predation (Gregory and Levings 1998), reduced visual ability to feed or avoid predation (Hansen *et al.* 2013), temporary displacement, various sublethal physiological effects, or even death depending on the amount or concentration of sediment (Bisson and Bilby 1982; Berg and Northcote 1985; Servizi and Martens 1992; Newcombe and Jensen 1996). Sediment could cause harm to ESA-listed species resulting in a range of effects described in Rowe *et al.* (2003) and Muck (2010). Effects from low to mid-range turbidity levels are summarized in Appendix B.

The FS/BLM program and POO approval are contingent upon IDWR, IDEQ, and EPA permitting and compliance. These permits include limits specific to turbidity, sedimentation, and bedload movement during the July 15 to August 15 season (IDEQ and EPA 2003; Idaho Administrative Procedures Act 37.03.07; EPA 2014). The EPA (2014) general permit limits turbidity from dredgers below 500 feet mixing zones to 5 nephelometric turbidity units (NTUs) above background levels which are less than 50 NTUs, and less than a 10% NTU increase above backgrounds greater than 50 NTUs that shall not exceed a maximum increase of 25 NTUs.

Turbidity caused by mining activities will mostly be at low levels (approximately 5 NTUs above background levels) and is expected to peak at about 20 to 50 NTUs for a few yards below 5-inch dredges (Stewart and Sharp 2003; Hassler *et al.* 1986; Harvey 1986; Harvey and Lisle 1998) or 6-inch dredges (Harvey *et al.* 1982; Figure 5). Low intensity turbidity within 150 feet mixing zones in the proposed action is not expected to reach 50 NTUs levels. At these levels, risk of injuries to fish would be more likely from extended durations of direct exposure (Figure 5). Salmonids are sensitive to low to mid-range turbidity increases and most will readily move out of it into non-affected areas (Bisson and Bilby 1982; Newcombe and Jensen 1996). Even if some fish remain in turbidity plumes under this program it is not expected to cause physiological effects on fish (Newcombe and Jensen 1996; Appendix B)

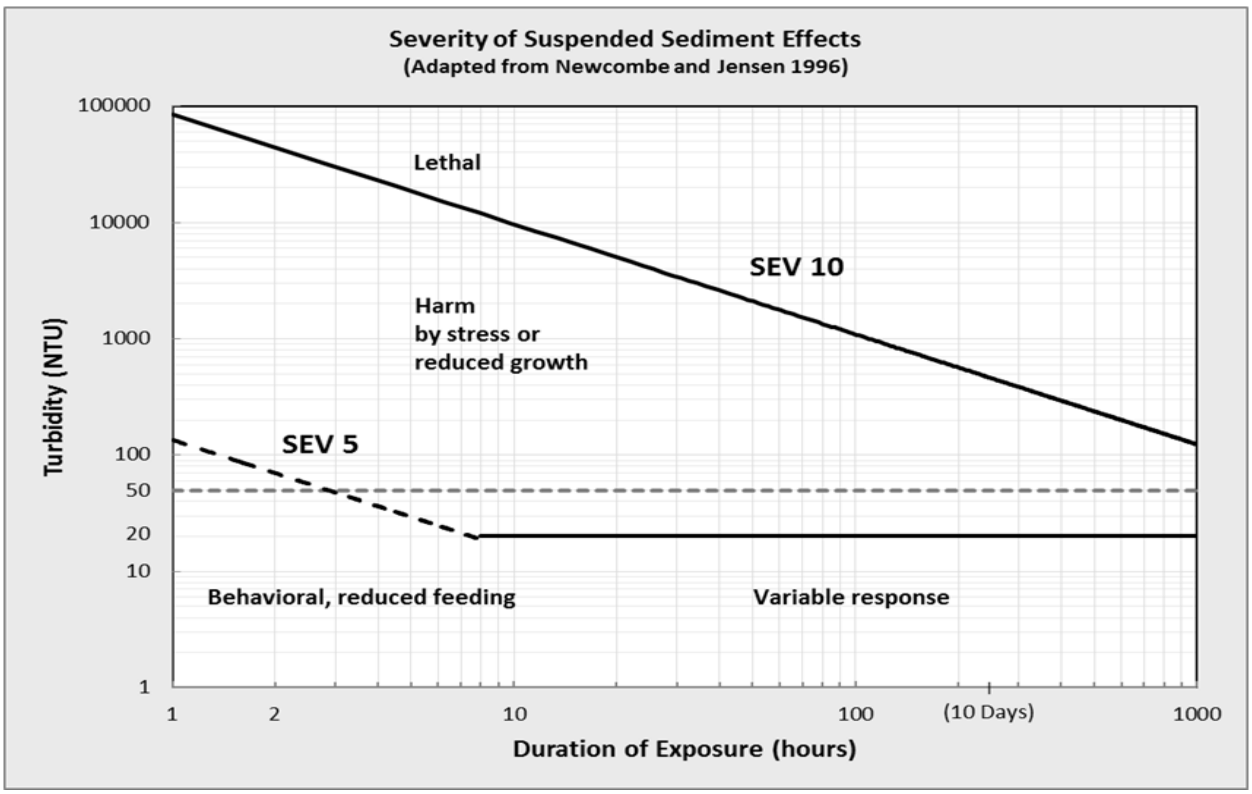

Figure 5. Relationship of turbidity, duration of exposure, and severity of effects (SEV) from NMFS (2012b) as reviewed and adapted from Newcombe and Jensen (1996; Model 3 for juvenile salmonids). The lines represent Newcombe and Jensen's severity of effects scores including SEV=5 (dashed line) and SEV=10 (solid line). The 50 NTU line (horizontal dashed is the State of Idaho instantaneous turbidity limit for cold water biota (IDAP 58.01.02.200.08).

Direct injury is not expected from turbidity, even with half day or longer durations, because turbidity levels are expected to remain low and plumes small due to the 150 feet visible plume limit. A minimum 800 feet separation between operations virtually eliminates risk of compound or higher-intensity sediment plumes in the proposed action. Tributary mouths, river banks, and slow-flowing channel margins will be protected, which is where most very young and relatively immobile fish rear. These areas may also support vegetation, collect LWD, smaller organic debris, and fine sediment that will not be disturbed. Avoidance of these areas helps reduce incidence and concentration of turbidity from program activities. Increased turbidity levels and settling rates of fine/coarse sediment from proposed activities will result in temporary displacement of some rearing fish, which will increase risk of predation and competition for surrounding cover in some instances. As noted in the discussion of feeding behavior and growth, above, temporary reductions in feeding may occur, but are not likely to appreciably reduce or alter growth.

Active dredging of 4 to 8 hours per day can produce substantial amounts of suspended solids which contribute to sedimentation (Harvey *et al.* 1982). Dredging excavates buried and compacted sediments and transports them onto substrate surfaces, and thus into the active river channel. Although much of the fine sediment will be replaced in dredge holes during reclamation, some will be moved downstream when exposed to current and not all can be reburied. Suspended fine and coarse sediments continually fall out and settle on substrates below the dredge, beneath the plume, and downstream in areas that were not otherwise disturbed by dredging (Hassler *et al.* 1986). Sand and fine sediment cover surfaces of substrates and fill interstitial spaces within the substrate. Current carries finer sediments downstream. These finer sediments fall out wherever currents slow, filling pools (Harvey *et al.* 1982; Lisle 1982) and slow-flowing channel margins, covering spawning gravels and other substrates, and filling interstitial spaces in those areas.

In a channel burdened with too much sediment, the quality and quantity of rearing habitat is already reduced and only limited areas may be available for early-rearing or overwintering fish (Bjornn *et al.* 1977; Henley *et al.* 2000; Suttle *et al.* 2004). Once sand fills depressions or gets under cobbles, it is not readily scoured (Mustonen *et al.* 2016). Generally, only flows above bankfull levels (greater than median) are enough to move limited amounts of sand within local riffle-pool sequences (Parkinson *et al.* (2012). Higher flow events (e.g., 10-year return frequency) are probably required to actually move enough bedload to scour large areas of clean substrates and form new habitat. Even after scouring, sand is resistant to moving very far downstream and may require many years to reduce overall loads from active channels (Bjornn *et al.* 1977; Lisle 1982; Henley *et al.* 2000).

The SFCR TMDL (IDEQ and EPA 2003) and suction dredging general permit (EPA 2014) limit processing to an average of 2 cubic yards (yd^3) per hour over the period of an 8-hour day. Total waste-load from suction dredging in the upper SFCR and tributaries is limited to 314 tons/day (IDEQ and EPA 2003). The proposed action of 15 operations each dredging 4 yd^3 per day for a 32-day season is expected to produce about 25% of the 314 tons/day sedimentation waste-load allocation for this activity in the SFCR TMDL. Operations are only expected to last about 4 to 8 hours per day on average and the protective measure limiting visible turbidity plumes to 150 feet in length will further limit the amount and minimize harmful impacts of sedimentation. Deposition of fines/sand deeper than ½-inch on top of substrates, in large proportions within mixed cobble piles, in quality pools, or along banks or shorelines is also prohibited in the proposed action.

Exclusions around major tributary mouths limit effects of sedimentation near those areas. However, increased sedimentation may occur around smaller tributary mouths with narrower exclusions in the proposed action. Well distributed spawning areas provide spatial structure and diversity to the SFCR steelhead population and help increase abundance and production. The SFCR includes two minor spawning areas (Mill and Meadow Creeks) not protected by the larger tributary exclusion. Peasley Creek is another small tributary near the minor spawning areas in the lower part of the action area. Mainstem SFCR spawning and early-rearing habitat and space are important around these and other small tributary mouths in the project area. Dredging-produced turbidity and sedimentation can increase fine sediment in localized spawning areas around small tributary mouths. Fine sediments reduce survival of incubating eggs and larval fish from oxygen reductions and reduce survival of early-rearing and older fish from increased predation associated with cover reductions. Increased competition for fewer remaining rearing sites could also temporarily lower growth and survival in localized areas. Other physical loss of cover will be minimized by protective measures prohibiting relocation of large boulders and woody debris, and requiring cobbles and smaller boulders be replaced in their original locations after mining.

Fuel contamination. Due to the close proximity of work activities to the stream, accidental releases of small amounts of fuel and oil from suction dredges may occur. Gasoline engines near and over water may leak, spill, or wash-off petroleum-based residues. Petroleum-based contaminants contain poly-cyclic aromatic hydrocarbons, which are acutely toxic to salmonids at high levels of exposure, bioaccumulate through food webs, and can also cause chronic sublethal effects to aquatic organisms at lower levels (Neff 1985; Varanasi *et al.* 1985; Meador *et al.* 1995). The FS/BLM minimization measures require: (1) Use of clean equipment that does not leak; (2) refueling with no more than 1-gallon at a time; and (3) providing a spill kit to clean up accidental spills. Therefore, NMFS expects that any potential spillage will not harm listed anadromous salmonids due to the minimization measures and the small amount of potential spill in relation to volume of streamflow that would dilute any spill.

Mercury and other metals contamination. If sediments containing heavy metals are brought to the surface and distributed, concentrations could increase in water and substrates (Johnson and Peterschmidt 2005). Too much exposure to metals could potentially reduce growth or cause developmental problems in salmonids (NMFS 2014b). Mercury may present relatively higher risk because of its strong tendency to bioaccumulate in muscle tissue and because it is a potent neurotoxin that causes neurological damage which in turn leads to behavioral effects, which in turn lead to reduced growth and reproductive effects (Wiener *et al.* 2003; Weis 2009; Sandheinrich and Wiener 2010). Methylmercury is a highly neurotoxic form that readily crosses biological membranes, can be rapidly bioaccumulated through the water, and is taken up primarily through the diet (which accounts for more than 90% of the total amount of methylmercury accumulated by fish). At much lesser extent, fish may also obtain mercury from water passed over the gills and fish also methylate inorganic mercury in the gut (Wiener and Spry 1996). Both organic and inorganic mercury bioaccumulate, but methylmercury accumulates at greater rates than inorganic mercury. Methylmercury is biomagnified between trophic levels in aquatic systems in general proportion to its supply in water (Wattras and Bloom 1992).

Mercury concentrations in the SFCR sediments or its salmonids and their prey are not well known and few data could be found to indicate particular concern. In the Clearwater drainage, concentrations of mercury in the water are generally low with an average of about 0.2 nanograms per liter (ng/L) mercury in the North Fork, Lochsa, and Selway Rivers (Essig 2010). Mercury concentrations are likely similarly low in the SFCR. Baseline mercury concentrations in water are likely similarly low in the SFCR. However, legacy mining in the SFCR and its tributaries could have increased mercury in sediments and dredging may bring some mercury to the surface. The concentration of mercury in water provides indication of how much mercury is in the system including its sediments and biota. If rivers have total mercury concentrations less than 2 ng/L, predicted concentrations of mercury in fish tissue would be expected to be less than 0.3 milligrams per kilograms (mg/kg) wet weight (ww) and would likely be sufficiently protective against risks of adverse effects to listed salmon and steelhead (NMFS 2014b).

Protective measures require miners, who may encounter mercury in exposed substrates or in dredged material, to not entrain, mobilize, or disperse any mercury. Miners also will not use mercury, cyanide, or any other hazardous or refined substance to recover or concentrate gold. The likely low level of mercury in the water and sediment baselines and the overall limited amount of dredging disturbance further lowers risk. Although harm to listed salmonids is not expected from miners exposing limited amounts of mercury and removing it, the encounter rates and amount of mercury removed should be reported by the FS/BLM.

2.4.1.2 Relevance of Fish Effects to Population Viability

Effects to individual fish may, in turn, affect the attributes associated with a population's viability, as described through VSP parameters. NMFS believes there will be a few instances of lethal effects on individuals in the area that is expected to be mined during the 10-year program. Mining operations will likely kill or injure a few pre-emergent alevins in redds and a few older juveniles that attempt to hide in substrates being dredged or covered, or that directly contact mining equipment. Primary effects will be increased predation from the temporary displacement of individual fish from cover by small and dispersed disturbances, and low-level turbidity. There is also risk of reduced growth and fecundity from small areas of temporarily disturbed or sedimented habitat that will reestablish productivity within a few months after each mining season. Overall, few fish from affected populations will be exposed to harmful project-related disturbances.

Because the number of individual fish affected from each population is expected to be very small, the effects of the proposed action are not expected to diminish the productivity, spatial structure, or genetic diversity of the SR fall Chinook population or the SFCR steelhead population. This determination is based on the following reasons: (1) The estimated number of juvenile fish rearing in the maximum area proposed to be dredged will be small in relation to river size and amount of available habitat and few fish are expected to be killed or injured; (2) the number of fish that might be temporarily displaced and die from increased predation is small in relation to the number of juveniles in the SFCR; (3) most juveniles and adults will avoid exposure by migrating through the action area prior to or after mining seasons; and (4) although there is risk that a redd will be disturbed in colder years of high flow that delay emergence rates and impede the identification and exclusion of potential spawning sites, this risk will be very low in any given year and at most very few redds will be affected during the duration of the program.

2.4.2 Effects on Critical Habitat

Critical habitat within the action area has an associated combination of physical and biological features essential for supporting spawning, rearing, and migrating steelhead populations. The steelhead critical habitat PBFs most likely to be affected by the proposed action include forage, cover/shelter, water quality, and substrate quality (Table 5).

Operation of suction dredges can alter stream ecosystems by excavating and scouring in-stream habitat, changing substrate composition, covering substrates and filling interstitial spaces, increasing turbidity and suspended sediment, increasing sedimentation, and destabilizing spawning gravels (Thomas 1985, Hassler *et al.* 1986; Somer and Hassler 1992; Harvey and Lisle 1998, 1999). Small stream habitats are more vulnerable than those of large rivers (Harvey and Lisle 1998). Daily access to mining sites, deploying equipment in riparian areas, and nearby camping in a remote area for a month-long season can lead to areas of river bank damage and reduced riparian vegetation (Harvey *et al.* 1982; Hassler *et al.* 1986; Prussian *et al.* 1999; Royer *et al.* 1999).

Well-designed protective measures can also effectively minimize impacts. The amount and significance of habitat alteration caused by suction dredging depends on where and how dredges are operated and the experience of miners (Prussian *et al.* 1999). Harvey and Lisle (1998) reviewed dredging literature and concluded that the effects of habitat alteration could be minor, localized, and brief, or may go as far as to harm population viability, depending on each particular stream system. Because dredging effects vary depending on the channel environment and dredging procedures, they recommended that managers carefully analyze the watershed where mining is proposed and tailor mining regulations to the particular issues and effects in the watershed. Consequently, the proposed dredge mining in the SFCR is managed in a program with comprehensive protective measures, monitoring, and adaptive management through annual review and conditioning of POOs to avoid or minimize habitat alterations.

2.4.2.1 Water Quality

Water quality in small parts of the action area may be temporarily degraded due to disturbance and resuspension of sediments during active mining. Intensive placer mining, by even small-scale hydraulic methods, can increase turbidity until resettled solids blanket existing substrate and habitat. In most situations the intensity or concentration of suspended sediments from small suction dredge operations remains low, but even low turbidity with sand in transport can be abrasive to periphyton and reduce its production (Steinman and McIntire 1990; Henley *et al.* 2000; Francoeur and Biggs 2006). Dredge operations typically do not create large plumes of turbidity in cobble and sand substrates, because coarser sediments tend to settle rapidly, which reduces sediment plumes to short distances. In the proposed action, suction dredge mining may only occur during daylight hours, during a short season, by a few operations, in small and dispersed sites, with a limit of 150 feet long visible turbidity plumes. In the SFCR, areas of silt, clay, fine sand, and organic debris are found along shallow channel edges with slower current and river banks. Disturbance in these substrates and areas can cause increased turbidity, larger plumes and longer suspension periods; however, general habitat exclusions protecting river banks, wetted perimeter, and slow-velocity channel margins will further minimize reductions in water quality from fine sediment. Overall reductions in water quality PBFs will be localized and temporary.

Fuel contamination. Due to the close proximity of work activities to the stream, accidental releases of small amounts of fuel and oil from suction dredges may occur. The FS/BLM minimization measures require: (1) Use of clean equipment that does not leak; (2) refueling with no more than 1-gallon at a time; and (3) providing a spill kit to clean up accidental spills. Therefore, NMFS expects that any potential spillage will not reduce water quality PBFs due to the minimization measures and the small amount of potential spill in relation to volume of streamflow that would dilute any spill.

Mercury contamination. If sediments containing heavy metals are brought to the surface and distributed, concentrations could increase in water and substrates (Johnson and Peterschmidt 2005). Mercury includes relatively higher risk because it bioaccumulates through primary producers to invertebrate prey consumed by salmonids (Wiener 1995). Too much exposure to mercury or other metals could potentially reduce growth or cause developmental problems in salmonids.

Mercury concentrations in the SFCR waters, sediments or its salmonids and their prey are not well known. In other areas of the Clearwater drainage, concentrations of mercury are generally low with an average of about 0.2 ng/L mercury in waters of the North Fork, Lochsa, and Selway Rivers (Essig 2010). Baseline mercury concentrations in water are likely similarly low in the SFCR. However, legacy mining in the SFCR and its tributaries could have increased mercury in sediments and dredging in deeper substrates or along bedrock may bring some mercury to the surface. The concentration of mercury in water provides indication of how much mercury is in the system including its sediments and biota. If rivers have total mercury concentrations less than 2 ng/L, predicted concentrations of mercury in fish tissue would be expected to be less than 0.3 mg/kg ww and would likely be sufficiently protective against risks to the function of listed salmon and steelhead habitat (NMFS 2014b).

Protective measures require miners, who may encounter mercury in exposed substrates or in dredged material, to not entrain, mobilize, or disperse any mercury and miners must not use mercury, cyanide, or any other hazardous or refined substance to recover or concentrate gold. The likely low level of mercury in the water and sediment baselines and the overall limited amount of dredging disturbance further lowers risk. The proposed action is not expected to cause degradation of water quality, substrate, or forage related PBFs from mercury. However, the frequency of encounter and amount of mercury found by miners should be reported, and the FS/BLM should establish a baseline by sampling background levels in water and suspended solids in turbidity plumes. If done early in the program, this would help verify that the risk posed by mercury or other metals or contaminants is indeed low.

2.4.2.2 Substrate

Spawning. Steelhead may spawn in recently mined areas of the SFCR. Salmonid redds are often placed in locations that contain geomorphic features and hyporheic flow (Montgomery *et al.* 1999; Geist and Dauble 1998) that may be preferred mining areas. Properly functioning spawning substrates filter particulates and stabilize velocity and temperature of subsurface flow, thereby improving its value for incubating eggs. Stable gravels with proper amounts of flow and low amounts of fine sediment are particularly important to incubating eggs and emerging alevins (Holtby and Healey 1986; Lisle and Lewis 1992; Suttle *et al.* 2004; Miller *et al.* 2008). Baseflows in the SFCR continue through fall, winter, and into early spring. Steelhead spawn in early spring about 8 months after the mining season. Most steelhead spawning occurs prior to the highest sustained flows of May and June that would move bedload. Thus spawning substrate PBFs could be reduced by unstable gravels or additional fine sediment left on substrates. Somer and Hassler (1992) monitored dredge sites and found that high flows, when available, redistributed bedload, filled dredge holes, and flushed sediment from the dredge sites. In lower flow years, relatively little bedload may be moved (sand is particularly resistant to scour) and some sites of mining disturbance may not be fully reclaimed by high flows for a year or more. Over time, some settling and compaction of loose sediment will occur from extended exposure to low flows and an anchor layer will begin to form with reestablishment of periphyton after days and months, which will help stabilize sites without high flows.

Protective measures in the proposed action will greatly reduce risk of spawning habitat alteration by requiring miners to avoid operating in high-frequency spawning areas such as gravel bars at pool tails, side channels, and tributary mouths. Miners are also required to fill in dredge holes, thin or disperse dredge tailings, and restore channel contours. Bonds posted prior to mining help ensure that sites are reclaimed. Miners are prohibited from hydraulically destabilizing areas of substrate, must replace larger cobbles/boulders to previous locations, must not leave piles of mostly fine sediment or tailings deeper than 4 inches, and generally must contour and reclaim mined areas to match that of the natural channel. In Lolo Creek, mined areas could not be visibly distinguished from unmined areas following one or more high flow events which indicates the success of these types of measures (Kenney 2013, 2014). Some workings in Lolo Creek were small enough and reclaimed so well that disturbance was hardly visible within a few weeks after mining without any high flow events.

Sedimentation and substrate embeddedness. Suction dredging produces turbidity that contributes to sedimentation, which is the tendency of sediment particles entrained in water to settle against a barrier, typically the river bottom. Depressions on and openings in substrate aggrade fine and coarse sediments, which increases embeddedness of cobbles (Lisle 1982). Incubating and rearing salmonids and their prey depend upon the roughness of substrates and their interstitial spaces for cover from swift currents and predators. Mining disturbance moves larger cobbles exposing fine sediments to current and fine sediments are brought to the surface from otherwise buried deposits and strata from past floods. Resuspension and redistribution of fines and sand at the surface can add to active loads already moving through the channel, simplifying substrates and reducing interstitial spaces available to fish and their prey, which can temporarily reduce fish and invertebrate densities in affected areas (Neff 1985; Bjornn and Reiser 1991; Suttle *et al.* 2004; Jones *et al.* 2015).

The SFCR TMDL (IDEQ and EPA 2003) and the suction dredging general permit (EPA 2014) limit waste-loads from suction dredging to 314 tons/day in the upper SFCR and tributaries (IDEQ and EPA 2003). Project activities of 15 operations each dredging 4 yd^3 per day for are expected to produce about 25% of the 314 tons/day sedimentation waste-load allocated for suction dredging. Protective measures will likely further limit the amount and minimize the adversity of sedimentation: visible turbidity in plumes stretching downstream is limited to 150 feet and daylight work (expected about 8 hours per day) limit sediment loads. Depositing sediment in quality pools, spawning gravels, or tributary mouths is minimized by exclusions in those areas. Depositing fines/sand deeper than ½-inch on top of substrates or in large proportions within mixed cobble piles is also prohibited.

The proposed action will cause small additions and redistributions of fine sediment but at daily rates well within waste-loads allocated by IDEQ and EPA (2003) that were designed to maintain an improving sediment baseline over the program term (EPA 2014). Increased sedimentation and cobble embeddedness from the proposed action will only temporarily and locally degrade spawning, cover, and forage PBFs.

Channel function. Alterations in channel function can change physical habitat features and substrate quality by directing or blocking current or underflow, causing changes to water and sediment quality, cover and forage, and obstructions to fish access. Even small operations can dig and deposit substantial amounts of sand. Sand piles can alter flow in small areas and change sediment aggradation and scour rates over larger areas (Lisle 1982). Riffle crests, riffle-pool sequences, the thalweg itself, braided channels, side channels, islands and bars, and banks can be altered, which can affect hydraulics, thermal dynamics, and bank stability.

Mining will occur within the wetted perimeter during baseflows of summer so disturbed areas remain low in elevation within the active channel away from river banks and are more likely to be scoured by high flows. Channel underflow and commonly colder flow from tributaries along the SFCR could be altered, which could impact spawning habitat and thermal refugia (Berman and Quinn 1991); however, the risk of these effects is minimal because mining at and below tributary mouths or in highest quality pools is prohibited. Protective measures prohibit damage to banks, alteration of channels or their function, and avoid tributary mouths and spawning bars/tails. Risk of habitat alteration is further limited by requirements to restore disturbed areas to pre-mined grades, fill holes, disperse tailings piles, and limit amounts of fine sediment left on substrate surfaces. A bond is required to ensure damaged areas are reclaimed. With these protections and the limited amount of small-scale and dispersed disturbance, the program will result in only minimal and short-term alterations and will not degrade channel connectivity, spawning, water and sediment quality, or food and cover PBFs.

2.4.2.3 Cover/Shelter and Food

Covering substrates and filling interstitial spaces with fine sediment can reduce the availability and function of escape cover and overwintering habitat for rearing salmonids (Smith and Griffith 1994). Smaller fish use smaller interstitial spaces and older rearing fish use larger spaces in larger cobbles. Increasing embeddedness of substrates with fine sediment and sand simplifies its function and decreases its value for rearing habitat. Reduced escape cover can increase predation and reduce growth of juvenile salmonids.

Suction dredging operations disturb (moving and covering) areas of channel substrate during the summer growing season. Dredge mining can dislodge or cover benthic organic matter, which is a primary source of carbon and energy for salmonid prey. Undisturbed substrate surfaces are typically covered by a living layer of algae and periphyton (complex assemblage of microalgae, cyanobacteria, microinvertebrates, their secretions, and detritus) attached to submerged surfaces. This is where most primary production occurs in flowing streams. Aquatic invertebrates and small forage fishes depend on these habitats; for example, primary forage of larval lampreys is green algae and diatoms (Simpson and Wallace 1982). Reduced primary and secondary production will occur until algae and microphytes reinvade mined areas.

Potential prey that live in or on substrates and may be reduced during operations and anywhere sand remains piled too deeply after operations include: aquatic insects and other macroinvertebrates (including, snails and mollusks), lampreys, amphibians, larval and other small fish. Both richness of types and density of forage could be reduced. Common forage fish are typically spring-summer spawners, usually spawning and rearing in areas of slower current in warming water before and during the proposed dredging season. In the SFCR, shiners may spawn from May through August; dace spawn in late spring-early summer; suckers may spawn from late spring into summer; northern pikeminnow spawn in June and July; peamouth spawn in late spring-early summer when water temperatures range from 53 to 64^{o}F (12 to 18ºC); chub spawn during mid-summer; and chiselmouth spawn during early summer when water temperatures reach about 60^{o} (16ºC) (Simpson and Wallace 1982).

Prey species require refuge and food (often from algae) to recolonize disturbed areas by drifting, crawling, swimming, or flying in from adjacent areas. The time required for recolonizing algae and aquatic invertebrates to reach pre-disturbance abundance levels and equilibrium is related to the spatial scale of initial habitat loss, the persistence of the excluding or disturbing mechanism, the size of adjacent or remnant invertebrate populations, the season in which the disturbance is taking place, and the life history characteristics of the invertebrate species (Mackay 1992). In the SFCR, increased sediment loads, harsh winters and limited growing seasons are expected to delay aspects of recolonization and reestablishment for months after mining (Griffith and Andrews 1981; Thomas 1985; Harvey 1986).

Protective measures included in the proposed action are key to minimizing loss of cover for fish and reductions of prey, these include: not piling fine sediment on substrates more than a half-inch deep, replacing sediment into dredge holes, reclaiming sites by conforming previous contours, and limits on piling cobbles with high-percentage fines. Avoiding riverbanks and the wetted perimeter, spawning gravel bars, and slow-flowing river margins further limit degradation of critical food producing habitats. Given the dispersed and relatively small area of riverbed proposed to be disturbed and the relatively fast (within months) reinvasion rates of algae and invertebrates from immediately adjacent habitat, reductions in primary production and forage are reasonably certain to temporarily occur in small areas, but will not appreciably reduce the long-term value of this PBF.

2.5 Cumulative Effects

"Cumulative effects" are those effects of future state or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation (50 CFR 402.02). Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA.

The action area for the proposed action is almost entirely comprised of Federal lands. However, road maintenance of Idaho highways tends to maintain channel movement and sinuosity limitations related to these roadways. Fishing and camping along the SFCR and its lower tributaries will continue and may increase. Impacts from non-Federal activities on state and private lands scattered throughout the drainage (e.g., logging, grazing, mining, and roads) will likely continue. Unpermitted suction dredging has been documented recently in the SFCR and some of its tributaries. Unmitigated instream mining causes significantly greater adverse effects to listed salmonids and damage to their critical habitat than that described for the proposed action because comprehensive protective measures are not applied. Unpermitted suction dredging in the SFCR has damaged riverbanks and early-rearing habitats of listed salmonids and caused large areas of turbidity and substrate disturbance without reclamation. Increased monitoring and enforcement associated with the proposed program is expected to reduce future incidence and duration of adverse effects from unpermitted dredging, and thus limit its future impact. NMFS is not aware of new state or private actions that are reasonably certain to occur or have effects in the action area. Generally, the types of ongoing non-Federal activities and effects described in the environmental baseline are expected to continue.

2.6 Integration and Synthesis

The Integration and Synthesis section is the final step in our assessment of the risk posed to species and critical habitat as a result of implementing the proposed action. In this section, we add the effects of the action (Section 2.4) to the environmental baseline (Section 2.3) and the cumulative effects (Section 2.5), taking into account the status of the species and critical habitat (section 2.2), to formulate the agency's biological opinion as to whether the proposed action is likely to: (1) Reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing its numbers, reproduction, or distribution; or (2) reduce the value of designated or proposed critical habitat for the conservation of the species.

The effects of the action on listed salmon and steelhead are expected to be small for several reasons. Mining disturbance will be limited to 15 dredge operations each year, season will be limited to one month in mid-summer, work area size will be a very small percentage of the action area, and work areas must remain at least 800 feet apart. Additionally, dredging will be located through exclusions and additional siting procedures (miner, USFS/BLM, and level 1 team) to avoid spawning and early rearing areas and not impede fish movement in and around mouths of tributaries. Miners will be limited to 15 horsepower engine and a 5-inch nozzle size, will be required to limit turbidity plumes to 150 feet, will be required to refill dredged holes with approximate pre-dredging substrate size composition before dredging another hole, and will apply other measures described in the proposed action. The program also includes frequent monitoring designed to ensure it is being implemented as proposed and its effects are no more than USFS/BLM has assumed.

The main effects of the program include: temporary displacement of fish caused by noise, visual disturbance, and turbidity; crushing and covering juvenile fish in substrates and entraining juvenile fish in dredges, including possibly pre-emergent fry; substrate sedimentation and reduction in rearing cover in localized areas; and temporary reduction in invertebrate species (salmonid forage) in small areas. Effects will occur primarily to rearing fish and will generally be small-scale and temporary. Very few direct instances of individual lethality are expected throughout the 10-year program term. Avoidance behavior will only temporarily displace some fish, resulting in slight increases in predation. Seasonal reductions in the physical structure of substrate cover and reduced invertebrate and other forage will occur. These reductions will have limited impact because immediately surrounding habitat will remain available and functional, disturbed areas will be reclaimed after mining, natural high flows, and time (in months) for algae and associated invertebrates to reinvade.

Exclusions around major tributary mouths will limit effects of mining disturbance and sedimentation near those areas. However, increased sedimentation may occur around smaller tributary mouths with smaller exclusions in the proposed action. Mainstem SFCR spawning and early rearing habitat and space is important around these and other small tributary mouths in the project area. Turbidity and fine sediment settling around these small tributary mouths could reduce survival of incubating eggs and larval fish from oxygen reductions and reduce survival of early-rearing and older fish from increased predation associated with cover reductions. Increased competition for reduced food and fewer remaining rearing sites could also temporarily lower growth and survival in localized areas. However, this effect is also expected to be minor because extended protection for perennial stream mouths from IDWR regulations are included as part of the proposed action, likely spawning and early-rearing habitat will be avoided, channel function will not be changed, and mined sites must be reclaimed.

The environmental baseline in the action area suffers from elevated water temperatures and increased sediment delivery due to activities such as timber harvest, grazing, fires, and roads. Unpermitted suction dredge mining has resulted in effects of similar type to those of the proposed action in the past but is expected to decrease with monitoring and enforcement. The proposed action will result in some additional turbidity and fine sediment deposition, but as described above this is expected to be minor and temporary. The affected salmon and steelhead populations are currently below viability targets needed for recovery. The listed salmon and steelhead ESUs and DPSs reviewed are not meeting recovery criteria. The effects of this action to the affected populations will not change the spatial structure or diversity of those populations or affect abundance or productivity because few individual fish are expected to be harmed.

The effects to critical habitat are expected to be similarly limited. Effects to water quality and substrate PBFs from mining disturbance will be temporary, dispersed, and minimal based on the program's limitations on locations, sizes of work areas, and other required measures. Temporary reductions in the cover and forage PBFs will occur in small dispersed areas until high flows redistribute and clean cobbles of sand, and primary producers recolonize disturbed areas within months. The proposed action will not alter the PBFs in a manner or to an extent that habitat functions for spawning, migration, juvenile rearing, growth and development will be appreciably changed in the short or long terms.

Terrestrial and tributary habitats of the SFCR drainage are impacted by timber harvest and roads and legacy mining. The upper SFCR channel and riparian habitat is impacted by highway along its course. Water quality is impaired by temperature and riparian vegetation and shade should be increased (IDEQ and EPA 2003). Sediment quality is also impaired by heavy loads of coarse sediment (sand) and load limits have been allocated for mining (IDEQ and EPA 2003). No metals contaminants of concern were identified for the SFCR. Analysis of mercury risks did not find data on mercury in the SFCR, but concentrations of mercury were quite low in other major tributaries of the upper Clearwater Basin and well below general levels that cause adverse effects on fish.

Carefully crafted conservation measures, monitoring to verify their effectiveness, and adaptive management to improve protections are included in the proposed program, which will avoid or limit habitat alterations over the term of the action. The action will temporarily degrade the water quality PBF, but only in small areas during active mining. The proposed action will reduce substrate function for cover and food temporarily and in small areas, but will not contribute to a long-term reduction in amount or function of the substrate PBF. Although sedimentation impairs the baseline, sediment loads produced by the proposed action are within allocated loads that will not substantially impede overall improvement of the substrate PBF.

Most land in the SFCR drainage is federally owned and land use in the action area over the 10-year term of the action is not expected to vary significantly from past use. Unpermitted suction dredging has increased sedimentation and other unmitigated adverse impacts, but increased monitoring and enforcement associated with the proposed program is expected to reduce future incidence and impact. Activities in small areas of private and state lands that generate sediment and turbidity are also expected to continue. Overall, no significant change in the baseline from the proposed action is anticipated.

In summary, the proposed action is likely to have only a minor effect on the PBFs at issue, in a small portion of designated critical habitat for SRB steelhead. These are not expected to rise to the level at which they might affect the value of critical habitat for the conservation of SRB steelhead.

2.7 Conclusion

After reviewing and analyzing the current status of the listed species and critical habitat, the environmental baseline within the action area, the effects of the proposed action, any effects of interrelated and interdependent activities, and cumulative effects, it is NMFS' biological opinion that the proposed action is not likely to jeopardize the continued existence of SRB steelhead and SR fall Chinook salmon, and is not likely to destroy or adversely modify designated critical habitat for SRB steelhead.

2.8 Incidental Take Statement

Section 9 of the ESA and Federal regulations pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without a special exemption. "Take" is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. "Harm" is further defined by regulation to include significant habitat modification or degradation that actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including breeding, spawning, rearing, migrating, feeding, or sheltering (50 CFR 222.102). "Incidental take" is defined by regulation as takings that result from, but are not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or applicant (50 CFR 402.02). Section 7(b)(4) and section 7(o)(2) provide that taking that is incidental to an otherwise lawful agency action is not considered to be prohibited taking under the ESA if that action is performed in compliance with the terms and conditions of this ITS.

2.8.1 Amount or Extent of Take

The proposed action is reasonably certain to result in limited amounts of incidental take of the ESA-listed species. NMFS is reasonably certain the incidental take described here will occur, because fish from two ESUs/DPSs are known to occur in the action area and the proposed action includes effects that may cause harm or death of individual fish that directly contact mining activities and moving substrates. Other fish will temporarily avoid areas of disturbance, low-level turbidity in water, or fine sediment settling over substrates, which is reasonably certain to lead to increased levels of predation on ESA-listed species. Finally, there will be short-term decreases in cover and forage for listed fish.

Monitoring or measuring the number of salmon or steelhead killed or harmed during project activities is not feasible. This is because it is not possible without knowing the precise number of juveniles hiding in substrate or the exact locations where mining may occur; this is highly variable between locations and time periods. Additionally, bodies of fish that are victims of predation will not be visible. Bodies of fish that have been crushed or smothered under substrates will not be visible. It is possible that bodies of fish that have been entrained through dredges could be visible but this is uncertain and only a few fish are expected to be killed. Fish that survive entrainment may still suffer from decreased fitness which might lead to death at a later time. For these reasons, NMFS will use surrogates for measures of the extent of take caused by the proposed action.

The number of fish that are harmed or killed by physical contact, reduction in cover, reduction in forage, turbidity, and sedimentation will be proportional to the amount of mining effort and, in turn, the amount of streambed disturbance. For this reason, the maximum potential area of mining disturbance under the proposed action is a suitable surrogate for the amount of harm or death caused by the proposed action. Additionally, an increase in hours of effort beyond what is expected will lead to an increase in fish directly contacting working dredges, shifting and falling cobbles, and piles of sediment on substrates.

The proposed action limits visible turbidity plumes to 150 feet in length and mining must slow or stop to maintain this limit. Some fish exposed to turbidity plumes are likely to move away from it, which will increase competition for cover and lead to increased risk of predation in localized areas. This effect is expected to return to background levels within the 150 feet downstream distance and cease when active dredging stops. Therefore, the number of fish affected relates not only to the area of substrate habitat disturbed but also to the area affected by elevated turbidity.

The extent of incidental take anticipated and analyzed in the Opinion will be exceeded if:

1. Turbidity over background levels is observed beyond 150 feet downstream of mining sites for more than 30 minutes (the 30-minute duration is to allow the miner sufficient time to adjust or stop activities if necessary),

2. Average dredging effort exceeds 8 hours per day or

3. Area disturbed by mining exceeds 0.4% of project area (1.2 acres) in any year, or

4. Average annual disturbance rate exceeds 0.2% (6 acres) of the 325-acre project area over 10 years.

Surrogate number 4 functions as an effective reinitiation trigger because it represents an annual limit for the activity and the consultation is for a 10-year period. Reinitiation could therefore be triggered earlier than when the action is proposed to be completed. The authorized take includes only take caused by the proposed actions within the action area as defined in this Opinion. The extent of take is the threshold for reinitiating consultation. Should this limit be exceeded, the reinitiation provisions of the Opinion apply.

2.8.2 Effect of the Take

In the Opinion, NMFS determined that the amount or extent of anticipated take, coupled with other effects of the proposed action, is not likely to result in jeopardy to the species or destruction or adverse modification of critical habitat.

2.8.3 Reasonable and Prudent Measures

"Reasonable and prudent measures" are nondiscretionary measures to minimize the amount or extent of incidental take (50 CFR 402.02).

The FS/BLM shall:

1. Minimize incidental take from suction dredging program activities through implementation of all precautionary measures.

2. Ensure completion of a monitoring and reporting program to confirm that the terms and conditions in this ITS are effective in avoiding and minimizing incidental take from permitted activities and that the extent of take is not exceeded.

2.8.4 Terms and Conditions

The terms and conditions described below are nondiscretionary, and the USFS, BLM, or any applicant must comply with them in order to implement the reasonable and prudent measures (50 CFR 402.14). The USFS, BLM, or any applicant has a continuing duty to monitor the impacts of incidental take and must report the progress of the action and its impact on the species as specified in this ITS (50 CFR 402.14). If the entity to whom a term and condition is directed does not comply with the following terms and conditions, protective coverage for the proposed action would likely lapse.

1. The following terms and conditions implement reasonable and prudent measure 1:

    a. Ensure that proposed protective measures are followed, including reclamation and compliance, monitoring and adaptive management, and any applicable seasons or permit conditions that may be more restrictive.

    b. Minor spawning areas of ESA-listed steelhead in Meadow, Mill, and Peasley Creeks may result in adult returns that tend to congregate and spawn in the SFCR near these smaller tributary mouths. Pay special attention in POO delineations to avoid spawning habitats and areas where fish concentrate near the mouths of these creeks.

2. The following terms and conditions implement reasonable and prudent measure 2:

    a. Monitor (via miner reports and weekly spot checks) the downstream extent and duration of visible turbidity plumes created by the action.

    b. Monitor to ensure no more than 0.4% of project area is disturbed in any year, and that disturbance rates average less than 0.2% over 10 years.

    c. Monitor to ensure that average dredging effort does not exceed 8 hours per day. Average dredging effort is specified as the total number of hours observed or reported each day divided by the maximum number of dredging operations possible (15). Daily effort will be summarized and reported weekly.

d. Monitor and report weekly injured or dead salmonids and salmonid forage fish found where death or injury was likely caused by the action.

e. Submit annual reports by May 1st of each year following program activities to:

National Marine Fisheries Service
Attn: Kenneth Troyer
800 E. Park Blvd.
Plaza IV, Suite 220
Boise, Idaho 83712-7768

2.9 Conservation Recommendations

Section 7(a)(1) of the ESA directs Federal agencies to use their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of the threatened and endangered species. Specifically, conservation recommendations are suggestions regarding discretionary measures to minimize or avoid adverse effects of a proposed action on listed species or critical habitat or regarding the development of information (50 CFR 402.02).

The following recommendations are discretionary measures that NMFS believes are consistent with this obligation and therefore should be carried out by the FS/BLM:

- Seek opportunities to further restore channel function and riparian vegetation in tributaries of the SFCR.

- Further reduce fine and coarse sediment from uplands and riparian areas caused by timber harvest, roads, and grazing to reduce long-term sedimentation in the SFCR.

- Implement increased monitoring and enforcement of unpermitted mining activities in the SFCR and its tributaries.

Please notify NMFS if the FS/BLM carries out these recommendations so that we will be kept informed of actions that minimize or avoid adverse effects and those that benefit ESA-listed species or their designated critical habitats.

2.10 Reinitiation of Consultation

This concludes formal consultation for the FS/BLM SFCR Suction Dredging Program.

As provided in 50 CFR 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained or is authorized by law and if: (1) The amount or extent of incidental taking specified in the ITS is exceeded, (2) new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not considered in this Opinion, (3) the action is subsequently modified in a manner that causes an effect to listed species or critical habitat that was not considered in this opinion, (4) a new species is listed or critical habitat designated that may be affected by the action.

To reinitiate consultation, the FS/BLM should contact the NMFS Idaho State Habitat Office in Boise, Idaho, and refer to the NMFS number assigned to this consultation.

3. MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT ESSENTIAL FISH HABITAT CONSULTATION

Section 305(b) of the MSA directs Federal agencies to consult with NMFS on all actions or proposed actions that may adversely affect EFH. The MSA (Section 3) defines EFH as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." Adverse effect means any impact that reduces quality or quantity of EFH, and may include direct or indirect physical, chemical, or biological alteration of the waters or substrate and loss of (or injury to) benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality or quantity of EFH. Adverse effects on EFH may result from actions occurring within EFH or outside of it and may include site-specific or EFH-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810). Section 305(b) also requires NMFS to recommend measures that can be taken by the action agency to conserve EFH.

This analysis is based, in part, on the EFH assessment provided by the FS/BLM and descriptions of EFH for Pacific coast salmon (PFMC 1999) contained in the fishery management plans developed by the Pacific Fishery Management Council (PFMC) and approved by the Secretary of Commerce.

3.1 Essential Fish Habitat Affected by the Project

The PFMC designated EFH in the states of Washington, Oregon, and Idaho for the freshwater life stages of Chinook salmon and coho salmon (PFMC 1999). The action and action area for this consultation are described in the Introduction to this document. The action area includes areas designated as EFH for various life-history stages of Chinook and coho salmon. Habitat areas of Particular Concern in the action area that would adversely affected by the action are local areas of cover and food producing substrates.

3.2 Adverse Effects on Essential Fish Habitat

Based on the information provided in the BA and the analysis of effects presented in the ESA portion of this document, NMFS concludes that the proposed action will have the following adverse effects on EFH designated for Chinook and coho salmon: (1) Localized and temporary disturbance of substrates reduce their function as cover for fish and their forage, and will require longer periods (days to months) to restore productivity, (2) in a channel laden with fine sediment and sand, dredging will add to active sedimentation by exposing buried fines to current and suspending fines that settle on other substrates, and (3) temporary increases in turbidity from dredging that temporarily reduce water quality in small areas.

3.3 Essential Fish Habitat Conservation Recommendations

NMFS believes that the terms and conditions in Section 2.8.4 of this document will also help avoid, mitigate, or offset the impacts of the action on EFH. The conservation recommendations below are similar, but not identical to the ESA Terms and Conditions:

a. Ensure that protective measures are followed, including those limiting turbidity, maintaining and reclaiming daily and seasonal disturbances, limiting overall surface area of disturbance, and avoiding sensitive habitats.

b. Spring/summer Chinook salmon adults may congregate and spawn near smaller tributary mouths (e.g., Mill, Meadow, and Peasley Creeks) soon after the mining season in the SFCR. Pay special attention in POO delineations to avoid spawning habitats and areas where fish concentrate near the mouths of these creeks.

c. Steelhead, Chinook and coho salmon spawning areas in the SFCR will be mapped and their spawning areas and habitat will be protected in POO delineations.

d. Ensure monitoring is completed to verify the effectiveness of protective measures and to enable adaptive habitat improvements.

Fully implementing these EFH conservation recommendations would protect, by avoiding or minimizing the adverse effects described in Section 3.2, above, approximately 325 acres of designated EFH for Pacific coast salmon. This area was estimated as the wetted channel area of the SFCR project area.

3.4 Statutory Response Requirement

As required by section 305(b)(4)(B) of the MSA, the FS/BLM must provide a detailed response in writing to NMFS within 30 days after receiving an EFH conservation recommendation from NMFS. Such a response must be provided at least 10 days prior to final approval of the action if the response is inconsistent with any of NMFS' EFH conservation recommendations, unless NMFS and the Federal agency have agreed to use alternative time frames for the Federal agency response. The response must include a description of measures proposed by the agency for avoiding, mitigating, or offsetting the impact of the activity on EFH. In the case of a response that is inconsistent with NMFS conservation recommendations, the FS/BLM must explain its reasons for not following the recommendations, including the scientific justification for any disagreements with NMFS over the anticipated effects of the action and the measures needed to avoid, minimize, mitigate, or offset such effects [50 CFR 600.920(k)(1)].

In response to increased oversight of overall EFH program effectiveness by the Office of Management and Budget, NMFS established a quarterly reporting requirement to determine how many conservation recommendations are provided as part of each EFH consultation and how many are adopted by the action agency. Therefore, we ask that in your statutory reply to the EFH portion of this consultation, you clearly identify the number of conservation recommendations accepted.

3.5 Supplemental Consultation

The FS/BLM must reinitiate EFH consultation with NMFS if the proposed action is substantially revised in a way that may adversely affect EFH, or if new information becomes available that affects the basis for NMFS' EFH conservation recommendations [50 CFR 600.920(l)].

4. DATA QUALITY ACT DOCUMENTATION AND PRE-DISSEMINATION REVIEW

The Data Quality Act (DQA) specifies three components contributing to the quality of a document. They are utility, integrity, and objectivity. This section of the opinion addresses these DQA components, documents compliance with the DQA, and certifies that this opinion has undergone pre-dissemination review.

4.1 Utility

Utility principally refers to ensuring that the information contained in this consultation is helpful, serviceable, and beneficial to the intended users. The intended users of this opinion are the FS/BLM. Other interested users could include mining operators, citizens of affected areas, and others interested in the conservation of the affected anadromous salmonids and their habitat. Individual copies of this Opinion were provided to the FS/BLM. This opinion will be posted on the Public Consultation Tracking System web site (https://pcts.nmfs.noaa.gov/pcts-web/homepage.pcts). The format and naming adheres to conventional standards for style.

4.2 Integrity

This consultation was completed on a computer system managed by NMFS in accordance with relevant information technology security policies and standards set out in Appendix III, 'Security of Automated Information Resources,' Office of Management and Budget Circular A-130; the Computer Security Act; and the Government Information Security Reform Act.

4.3 Objectivity

Information Product Category: Natural Resource Plan.

Standards: This consultation and supporting documents are clear, concise, complete, and unbiased; and were developed using commonly accepted scientific research methods. They adhere to published standards including NMFS ESA Consultation Handbook, ESA Regulations, 50 CFR 402.01, et seq., and the MSA implementing regulations regarding EFH, 50 CFR 600.

Best Available Information: This consultation and supporting documents use the best available information, as referenced in the References section. The analyses in this Opinion and EFH consultation contain more background on information sources and quality.

Referencing: All supporting materials, information, data and analyses are properly referenced, consistent with standard scientific referencing style.

Review Process: This consultation was drafted by NMFS staff with training in ESA and MSA implementation, and reviewed in accordance with West Coast Region ESA quality control and assurance processes.

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APPENDIX A

Predicting Lolo Creek Emergence Times of Steelhead Alevins from Redds

To determine probable spawning times of Lolo Creek steelhead, NMFS gathered as much site observation data as available on Lolo Creek steelhead, other known observations on naturally spawning Snake River Basin steelhead, hatchery steelhead/rainbow trout development data, flow data from Lolo Creek, and temperature data from Lolo Creek. By combining these sources of information, the conclusion is that Lolo Creek steelhead will spawn over a wide range of time and temperatures within a given year. Steelhead may tend to spawn just before, during, and after spring high flow events. In Lolo Creek, highest flows typically occur between mid-April and mid-May in most years. Steelhead eggs are known to mature very slowly at temperatures below 7.2°C (45°F). Based on two observations of spawning steelhead (May 5, 2003 and June, 1960 [no day provided]), it seems probable that Lolo Creek steelhead typically spawn between mid-April and June 1. During the typical spring temperature years of 2001, 2003, and 2005, the optimal egg development temperature of 7.2°C (45°F) occurred on May 12, May 22, and May 23. This is within the range of assumed spawning time for Lolo Creek steelhead.

The amount of centigrade temperature units (CTUs) needed by steelhead to hatch and emerge from redds varies considerably at different water temperatures. Table A-1 below derived from Leitritz and Lewis (1976) illustrates this. A CTU equals the sum of mean daily temperatures above 0°C (32°F).

Table A-1. Number of days and CTUs required for steelhead eggs to hatch

Water °C (°F).	Days to Hatch	CTUs Required
4.4 (40)	88	356
7.2 (45)	48	346
10 (50)	31	310
12.8 (55)	24	306
15.6 (60)	19	296

As this table illustrates, not only does the days to hatch decrease dramatically with increasing temperature of 7.2°C (45°F) and above, but the number of required CTUs also drops. The combination of these two has the effect of bringing the hatching time of eggs spawned over a 3- to 4-week period of cold temperature in the spring very close together.

NMFS used data on CTUs for first emergence from gravel of rainbow trout at an average water temperature of 7.5°C (46° F) (84 days and 632 CTUs) (Roberts 1988), and data on CTUs for first emergence from a naturally spawned redd in Gumboot Creek, Imnaha River (Stack and Bronec 1998) with an average water temperature of 10.8°C (51°C) (41 days and 442 CTUs). Using these CTUs as representative of emergence times based on their water temperatures, NMFS interpolated first emergence dates using Lolo Creek average water temperature data for the years 1992, 1993, 2001, 2002, 2003, and 2005. May 10 and June 1 were the assumed spawning dates for this analysis. The results are shown in Table A-2.

Table A-2. Estimated Fry Emergence Dates

Year	Spawned May 10 Start Emerge	Spawned June 1 Start Emerge	Spawned May 10 80 % Emerge	Spawned June 1 80% Emerge
1992*	6/11*	6/20-6/21	6/21	6/30
1993	7/9	7/13	7/19	7/21
2001	7/5-7/6	7/7-7/8	7/15	7/17
2002	7/16	7/16	7/26	7/26
2003	7/4-7/5	7/5-7/6	7/14	7/15
2005	7/1-7/2	7/5	7/11	7/15

(*The start date for 1992 was May 19 because no temperature data were available before that date.)

Thurow (1987) showed that 98% of steelhead alevins emerge within 14 days on the South Fork Salmon River. This data indicates that typically about 80% emergence occurs within 7 days. The data also shows that (based on five redds each of 2 years) alevins from different redds began emerging within 3 days of each other. Within 10 days of the first emergence, 80% of alevins had emerged as fry in all five redds. This was consistent in 1984 (considered a cold year) and 1985 (considered a typical year). Apparently, at the time of emergence in both years, the South Fork Salmon River was close to the same temperature. Table A-2 illustrates this additive factor as 80% emerge. Based on these dates, the following range of emergence times for Lolo Creek steelhead fry can be assumed. In very warm springs (1992), steelhead will start emerging in early June and finish by about June 15. In very cold springs (1993 and 2002), steelhead will start emerging between July 9 and 16 and finish about July 26. In what are considered typical spring water temperature years (2001, 2003, and 2005), Lolo Creek steelhead will start emerging between July 1 and 6 and finish emerging by July 17.

These data findings are consistent with the 2-year study of Thurow (1987) for steelhead incubating in Poverty Flat of the South Fork Salmon River. In Thurow (1987), a cold year, steelhead began emerging on July 13 and completed 80% emergence by July 23. The consistency in the start date of steelhead emergence from five different redds each year is significant because these redds were randomly selected and could have been created over a wide period of time. These data are also consistent with NMFS' approximation of emergence dates based on knowing average stream CTUs and then interpolating between known emergence dates from gravel redds. These results indicate that redds created weeks apart in water having a consistent warming trend will tend to hatch within a narrow time range.

References

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APPENDIX B

Table B-1. Summary of effects on fish, periphyton, and invertebrates associated with various turbidity ranges. Nephelometric turbidity units (NTUs) and Jackson turbidity units (JTUs) are roughly equivalent. This table and the references for these effects are found in Rowe *et al.* (2003).

Effect	Organism	Turbidity range	Reference
Increased blood sugar levels	Juvenile coho	Linear correlation	Sevizi and Martens 1992
Increased coughing	Juvenile coho	3 – 30 NTU for 24 hours	Sevizi and Martens 1992
Altered behavior	Juvenile coho	10 – 60 NTU	Berg 1982; Berg and Northcote 1985
	Largemouth bass and green sunfish	14 – 16 JTU	Heimstra *et al.* 1969
	Steelhead and coho	11 – 51 NTU	Sigler *et al.* 1984
Emigration/avoidance	Juvenile coho and steelhead	22 – 265 NTU	Sigler 1980
	Juvenile coho	>37 NTU	Sevizi and Martens 1992
	Juvenile coho	10 – 60 NTU	Berg 1982; Berg and Northcote 1985
Reduced feeding rate	Brown trout	7.5 NTU	Bachman 1984
	Lahontan cutthroat trout and Lahontan redside shiner	3.5 – 25 NTU	Vinyard and Yuan 1996
Reduced reaction distance	Lake trout, rainbow trout, cutthroat trout	3.2 – 7.4 NTU	Vogel and Beauchamp 1999
	Brook trout	0 – 43 NTU	Sweka and Hartman 2001
Reduced growth	Juvenile coho and steelhead	22 – 113 NTU	Sigler 1980
	Juvenile coho and steelhead	as low as 25 NTU	Sigler *et al.* 1984
Reduced survival	Juvenile coho	15 – 27 JTU	Smith and Sykora 1976
Reduced primary production	Algae/periphyton	3 – 25 NTU	Lloyd *et al.* 1987
Reduced density	Benthic invertebrates	8.4 – 161 NTU	Quinn *et al.* 1992
Reduced feeding rate, food assimilation, and reproductive potential	*Daphnia pulex*	10 NTU	McCabe and O'Brien 1983

References

Rowe, M., D. Essig, and B. Jessup. 2003. Guide to Selection of Sediment Targets for Use in Idaho TMDLs. Idaho Department of Environmental Quality. June 2003.

APPENDIX C

Table C-1. Perennial and fish-bearing streams that flow into the SFCR project area identified by the FS/BLM. Streams listed in order from the downstream-most portion of the project area by Dan Kenney, NPCNF on June 3, 2016. Streams reaching confluence on private land and intermittent streams identified on USGS quads were omitted from this list; fish-bearing streams per NPCNF Geographic Information System database).

Stream Name	Fish-bearing	T,R, S, 1/4 S	Fed Mgmt @ mouth
Green Creek	Yes	T30N, R4E, S9 NE	FS
Unnamed		T30N, R4E, S7 NE	BLM
Downey Creek		T30N, R4E, S19 NE	FS
Unnamed		T30N, R4E, S30 SW	FS
Unnamed		T30N, R4E, S30 SW	FS
Farrens Creek		T30N, R3E, S36 SW	FS
Unnamed		T29N, R3E, S1 NE	FS
Cove Creek		T29N, R3E, S12 NE	FS
Dump Creek		T29N, R4E, S18 SW	FS
Earthquake Creek	Yes	T29N, R4E, S18 SW	FS
Bully Creek		T29N, R4E, S19 NE	FS
Sheep Creek		T29N, R4E, S20 SW	FS
Jungle Creek		T29N, R4E, S20 SW	FS
Bivouac Creek		T29N, R4E, S20 SE	FS
Nelson Creek		T29N, R4E, S20 SE	FS
Grouse Creek		T29N, R4E, S28 NW	FS
Castle Creek	Yes	T29N, R4E, S28 NW	FS
Unnamed		T29N, R4E, S28 NE	FS
Browns Creek		T29N, R4E, S28 SE	FS
Mill Creek	Yes	T29N, R4E, S26 NW	FS
Meadow Creek	Yes	T29N, R4E, S26 NW	FS
Unnamed		T29N, R4E, S26 NE	FS
Unnamed		T29N, R4E, S25 NW	FS
Unnamed		T29N, R4E, S25 NE	FS
Johns Creek	Yes	T29N, R5E, S30 NW	FS
Wickiup Creek		T29N, R5E, S30 NE	FS
Ralph Smith Creek		T29N, R5E, S29 NW	FS
Cougar Creek	Yes	T29N, R5E, S29 SE	FS
Unnamed		T29N, R5E, S29 SE	FS
Otter Creek	Yes	T29N, R5E, S28 SE	FS
Granite Creek		T29N, R5E, S27 SW	FS
Peasley Creek	Yes	T29N, R5E, S27 SE	FS
Unnamed		T29N, R5E, S35 NW	FS
Huddleson Creek	Yes	T29N, R5E, S35 NW	FS

Stream Name	Fish-bearing	T,R, S, 1/4 S	Fed Mgmt @ mouth
Unnamed		T29N, R5E, S35 SE	FS
Silver Creek	Yes	T29N, R5E, S36 SW	FS
Wing Creek	Yes	T28N, R5E, S1 NE	FS
Twentymile Creek	Yes	T28N, R6E, S6 NW	FS
Surveyor Creek		T28N, R6E, S6 NE	FS
Droogs Creek		T28N, R6E, S5 NE	FS
Unnamed		T28N, R6E, S4 NW	FS
Unnamed		T28N, R6E, S4 NE	FS
Unnamed		T28N, R6E, S4 NE	FS
Unnamed		T28N, R6E, S4 NE	FS
Unnamed		T29N, R6E, S34 SW	FS
Reed Creek	Yes	T29N, R6E, S34 SE	FS
Rainy Day Creek		T29N, R6E, S34 SE	FS
Tenmile Creek	Yes	T29N, R6E, S35 SW	FS
Harman Creek		T29N, R6E, S35 NW	FS
Browns Creek		T29N, R6E, S35 NE	FS
Buckhorn Creek	Yes	T29N, R6E, S36 NE	FS
Fall Creek	Yes	T29N, R7E, S31 NW	FS
Santiam Creek	Yes	T29N, R7E, S31 NE	FS
Unnamed		T29N, R7E, S30 NE	FS
Leggett Creek	Yes	T29N, R7E, S29 NE	FS
Newsome Creek	Yes	T29N, R7E, S29 NE	FS
Rabbit Creek	Yes	T29N, R7E, S28 NW	FS
Unnamed		T29N, R7E, S28 NE	FS
Allison Creek	Yes	T29N, R7E, S22 SW	FS
Moose Creek	Yes	T29N, R7E, S22 SW	FS
Unnamed		T29N, R7E, S22 SW	FS
Center Star Creek		T29N, R7E, S26 NW	FS
Unnamed		T29N, R7E, S26 NE	FS
Dutch Oven Creek		T29N, R7E, S23 SW	FS
Crooked River	Yes	T29N, R7E, S25 NE	FS
Unnamed		T29N, R7E, S25 NE	FS
Unnamed		T29N, R8E, S30 NW	BLM
Whiskey Creek	Yes	T29N, R8E, S29 NW	BLM
American River	Yes	T29N, R8E, S33 NW	BLM
Red River	Yes	T29N, R8E, S33 NW	BLM